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Mizutani

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(54) **GOLF CLUB**

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(51) **Int. Cl.**
A63B 53/02 (2015.01)
A63B 53/04 (2015.01)

(52) **U.S. Cl.**
CPC ***A63B 53/02*** (2013.01); ***A63B 53/0466*** (2013.01); *A63B 2053/022* (2013.01); *A63B 2209/00* (2013.01); *A63B 2225/093* (2013.01)

(58) **Field of Classification Search**
CPC A63B 53/02; A63B 2053/023; A63B 2053/028
USPC 473/305, 307–310
See application file for complete search history.

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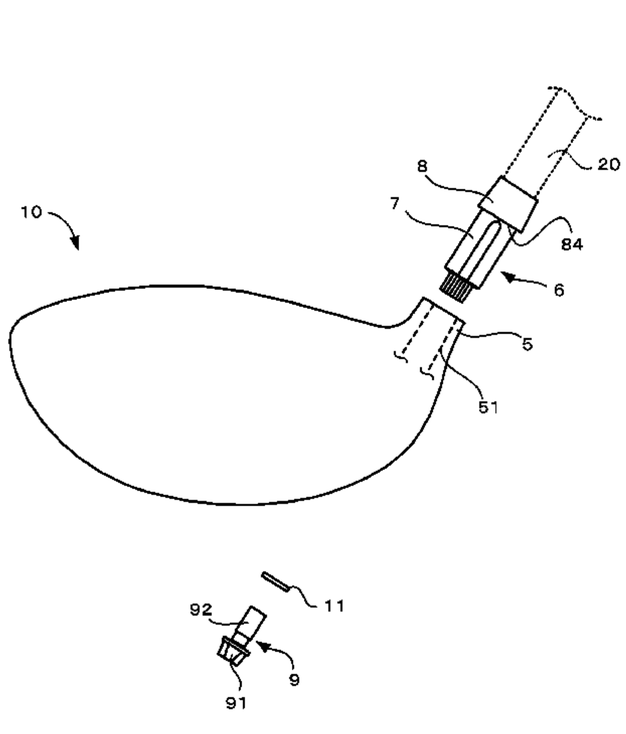
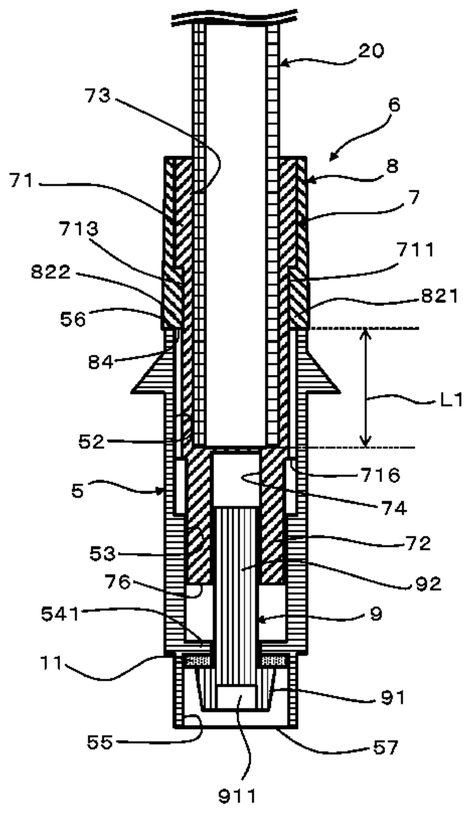
Primary Examiner — William M Pierce
(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch & Birch LLP

(57) **ABSTRACT**

A golf club according to one aspect of the present invention includes a shaft, a golf club head including a hosel containing a hole to attach the shaft, and a sleeve system including a body attached to a tip of the shaft and inserted together with the shaft into the hole of the hosel and an adaptor attached to the body so as to enable an adjustment of an axis-directional position with respect to the body and engaging with an upper end of the hosel.

2 Claims, 23 Drawing Sheets





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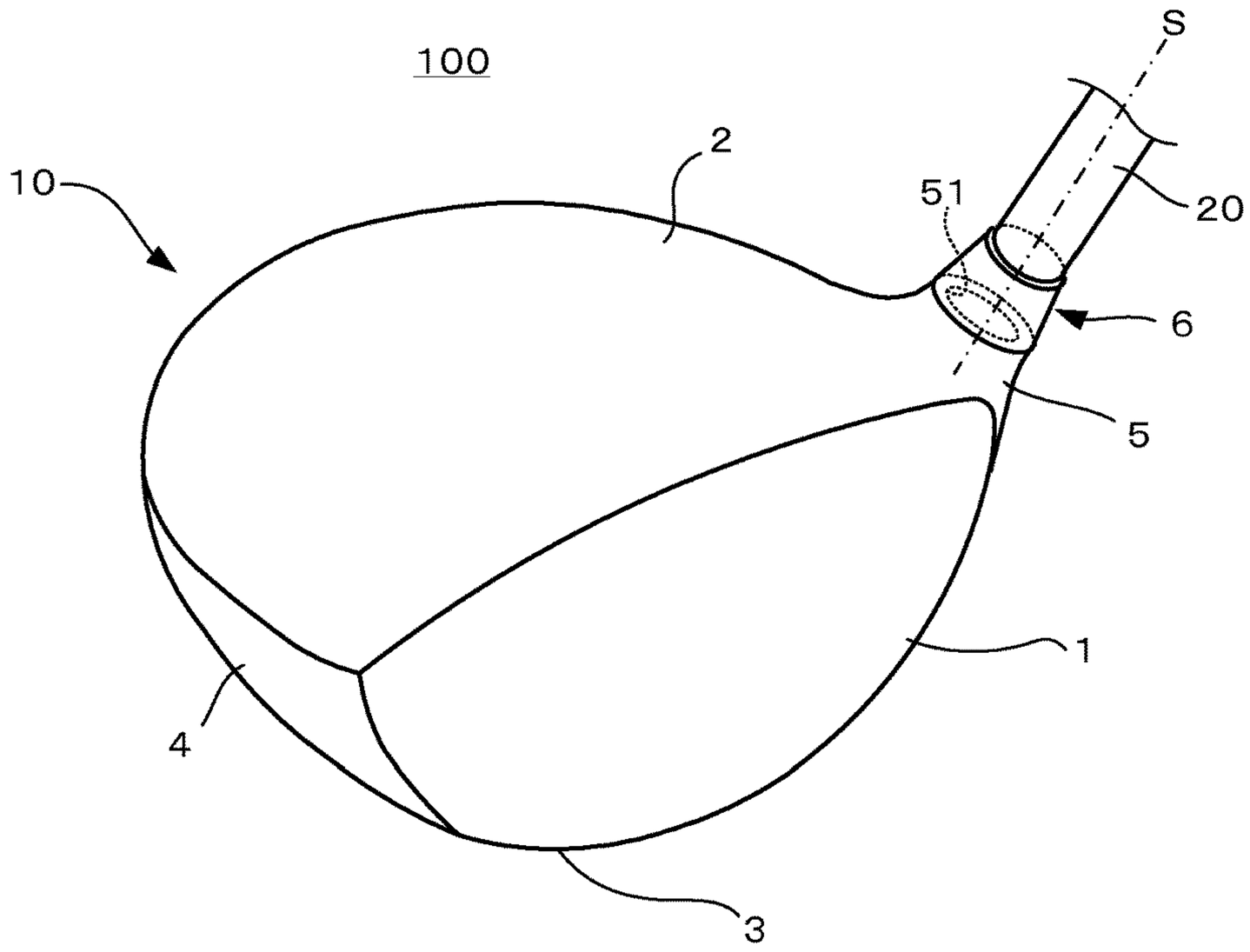
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FIG.1

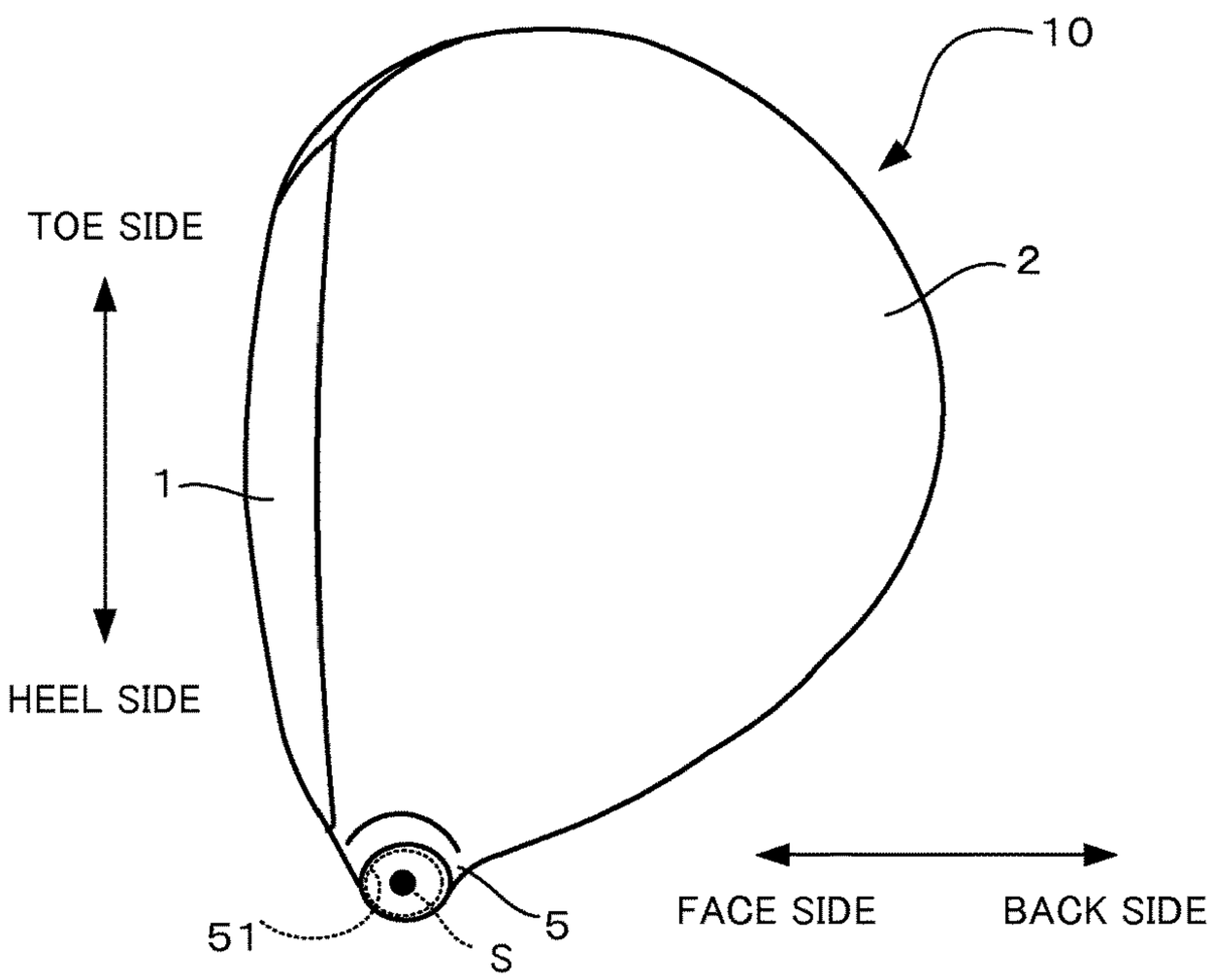
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FIG.2

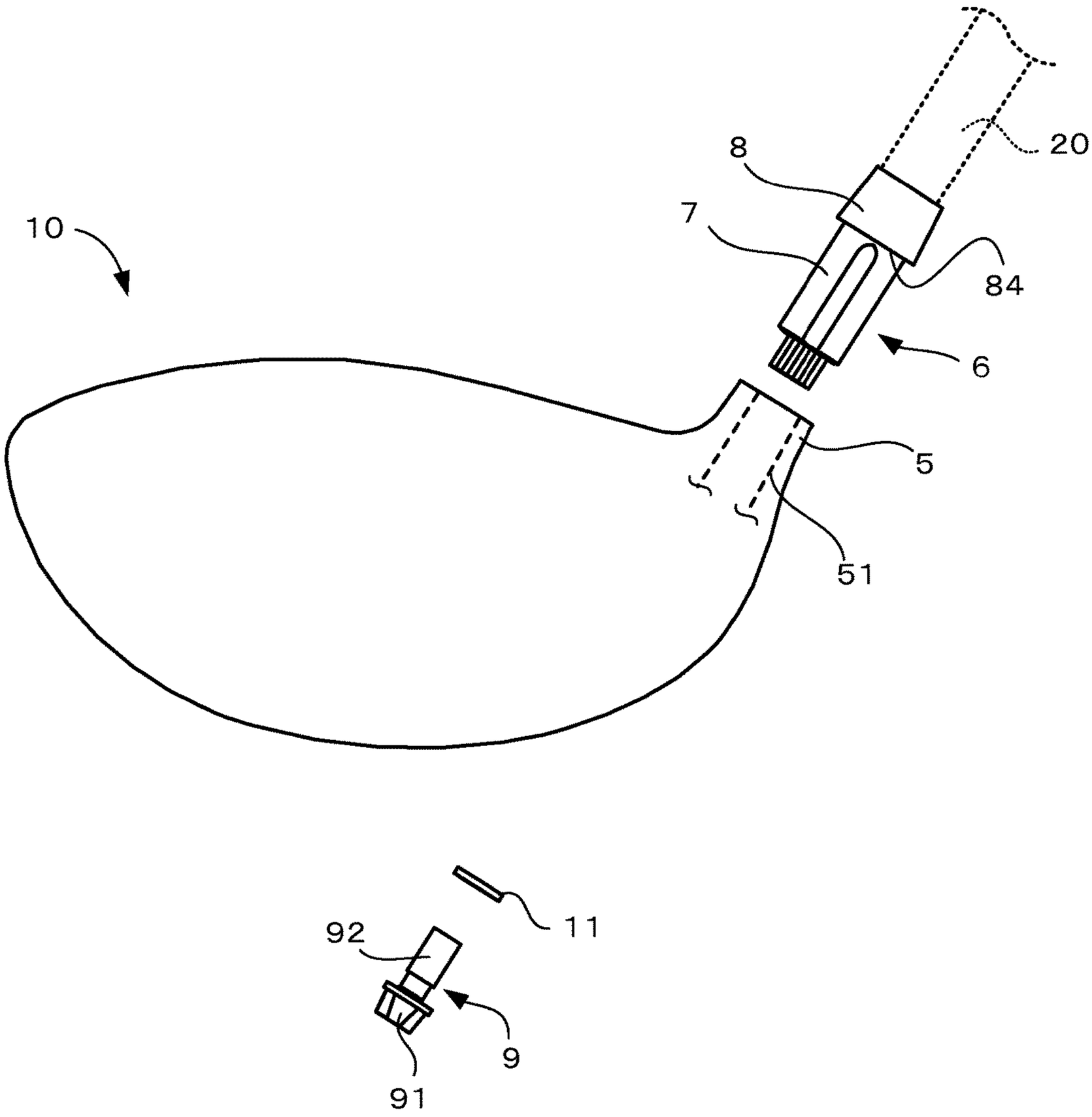


FIG.3

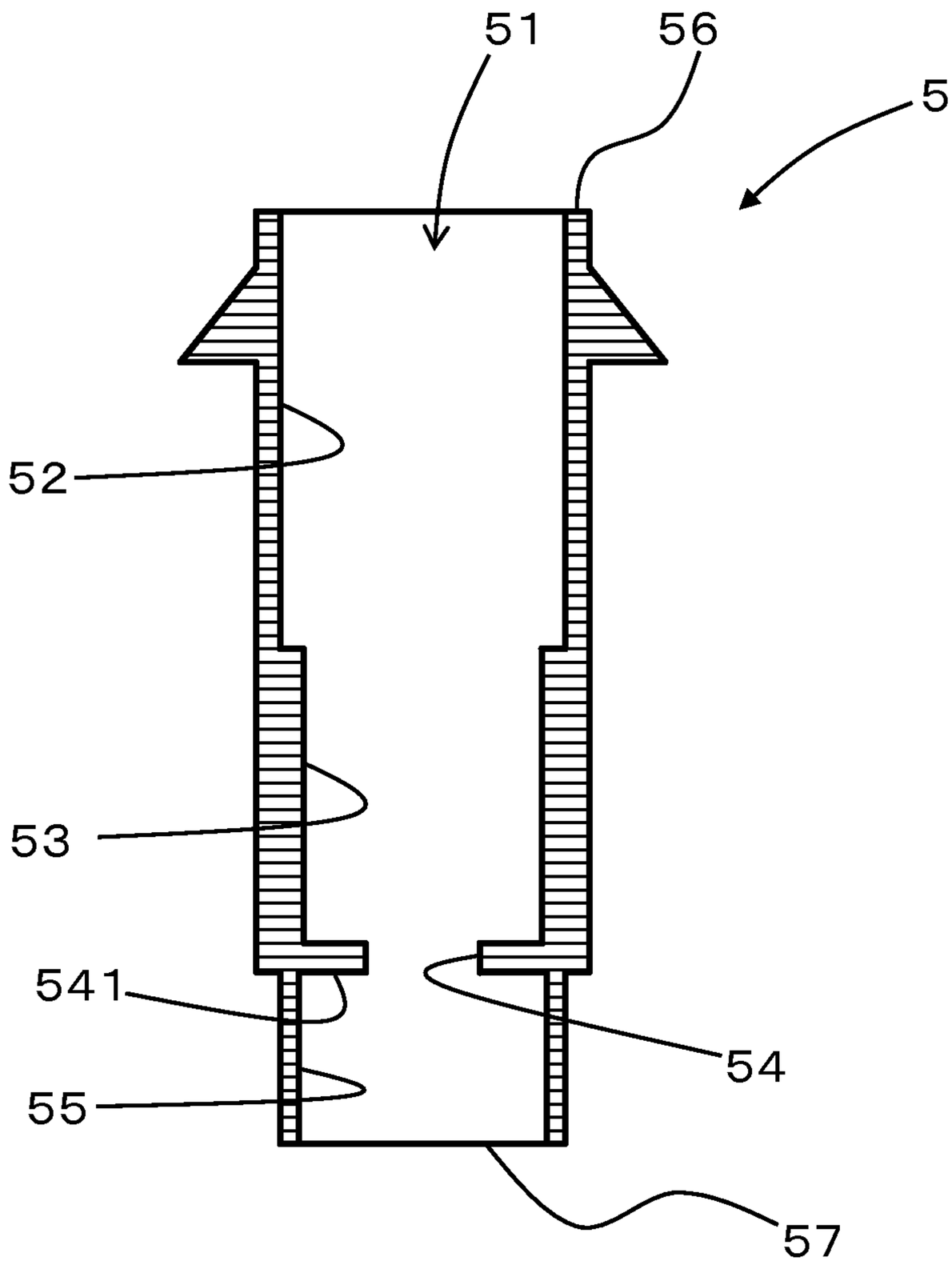


FIG.4

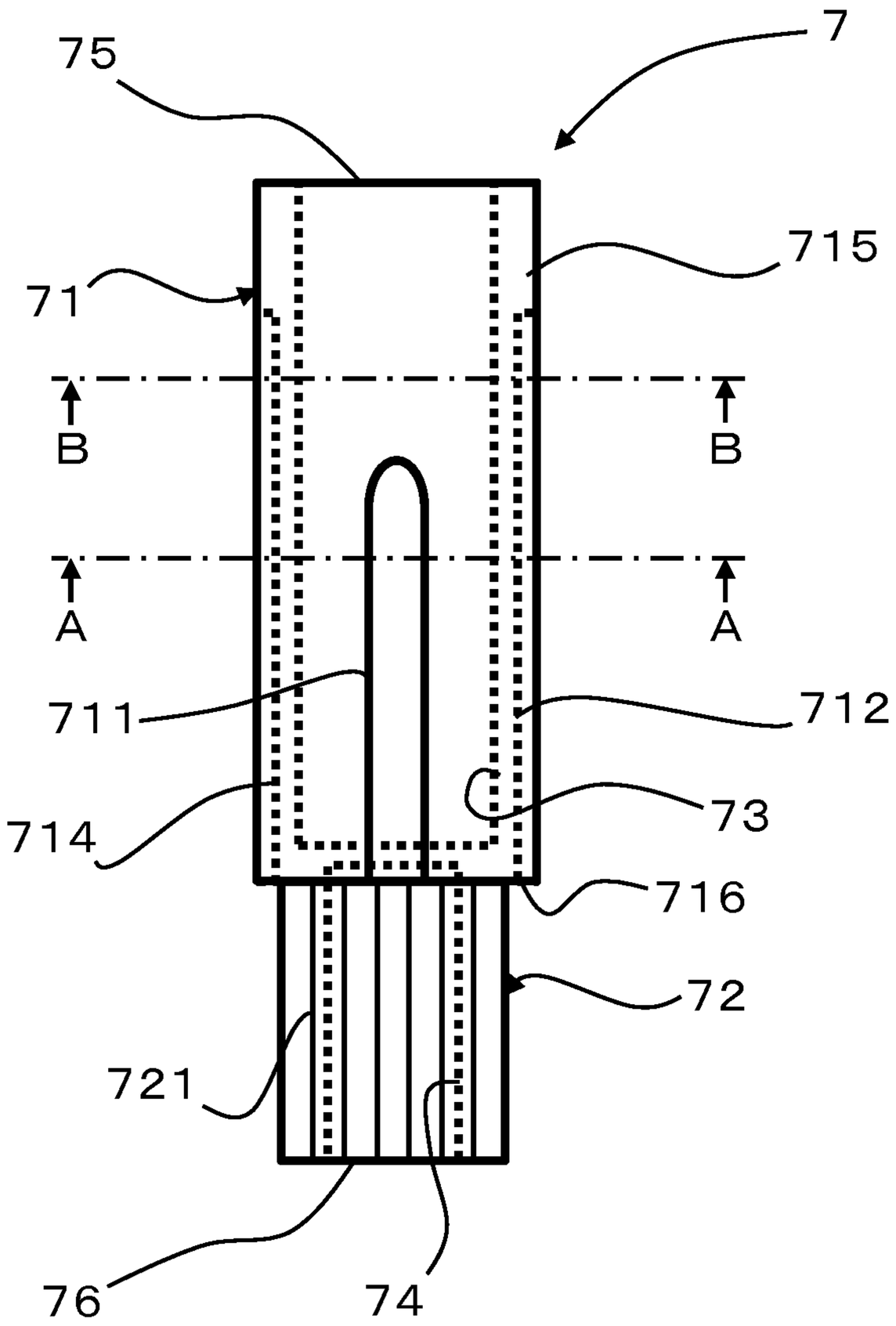


FIG.5A

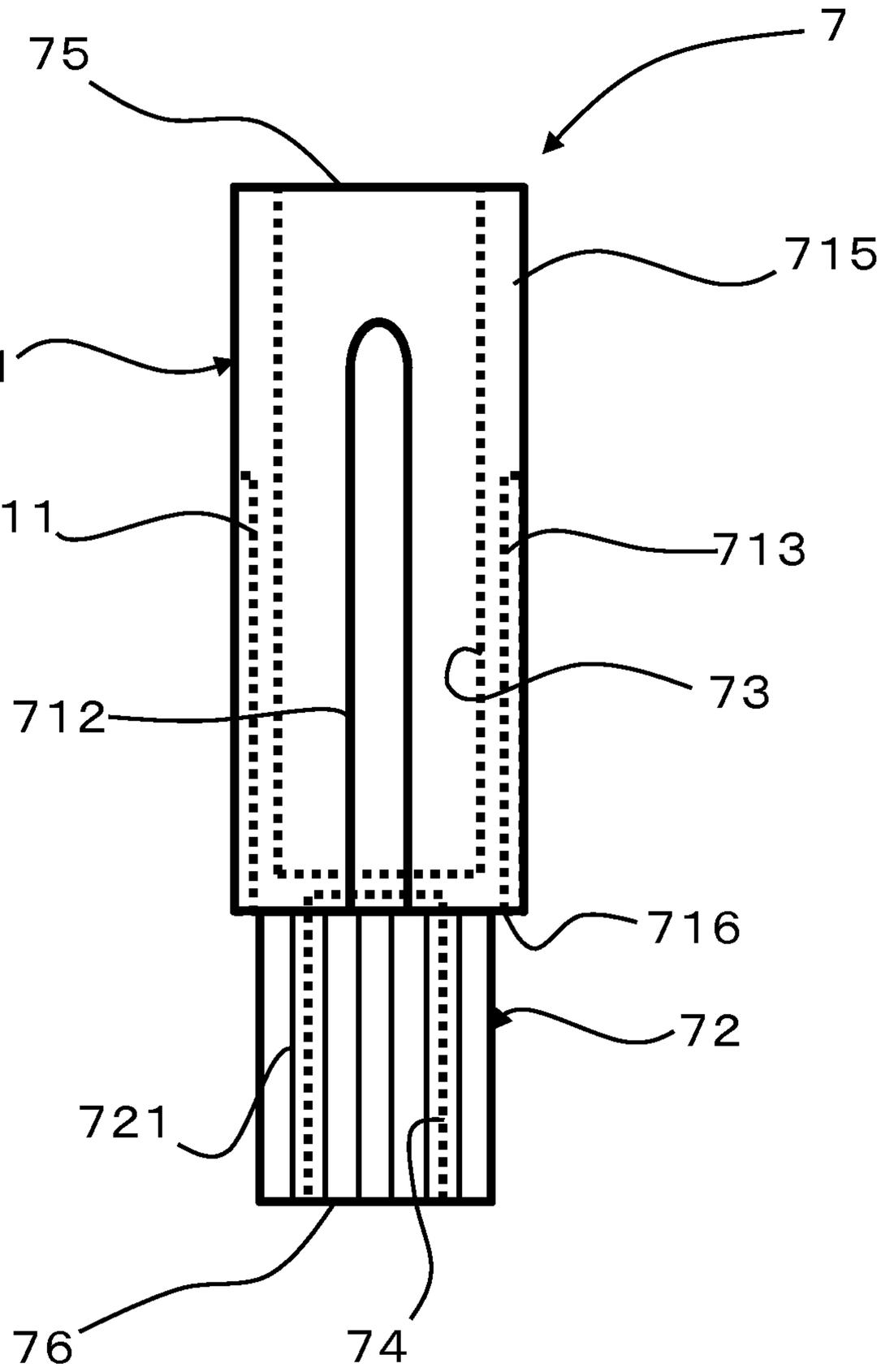


FIG.5B

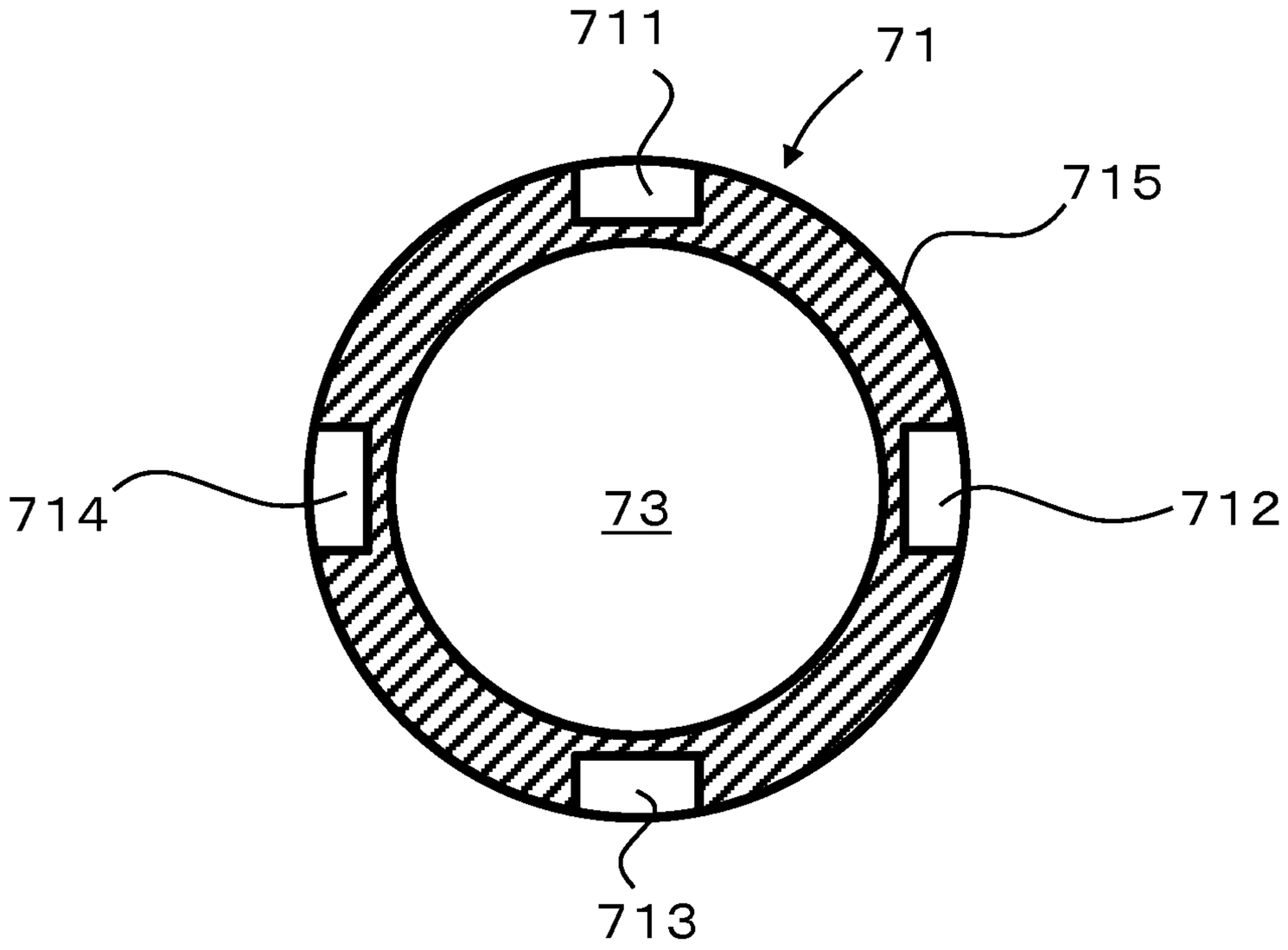


FIG.6A

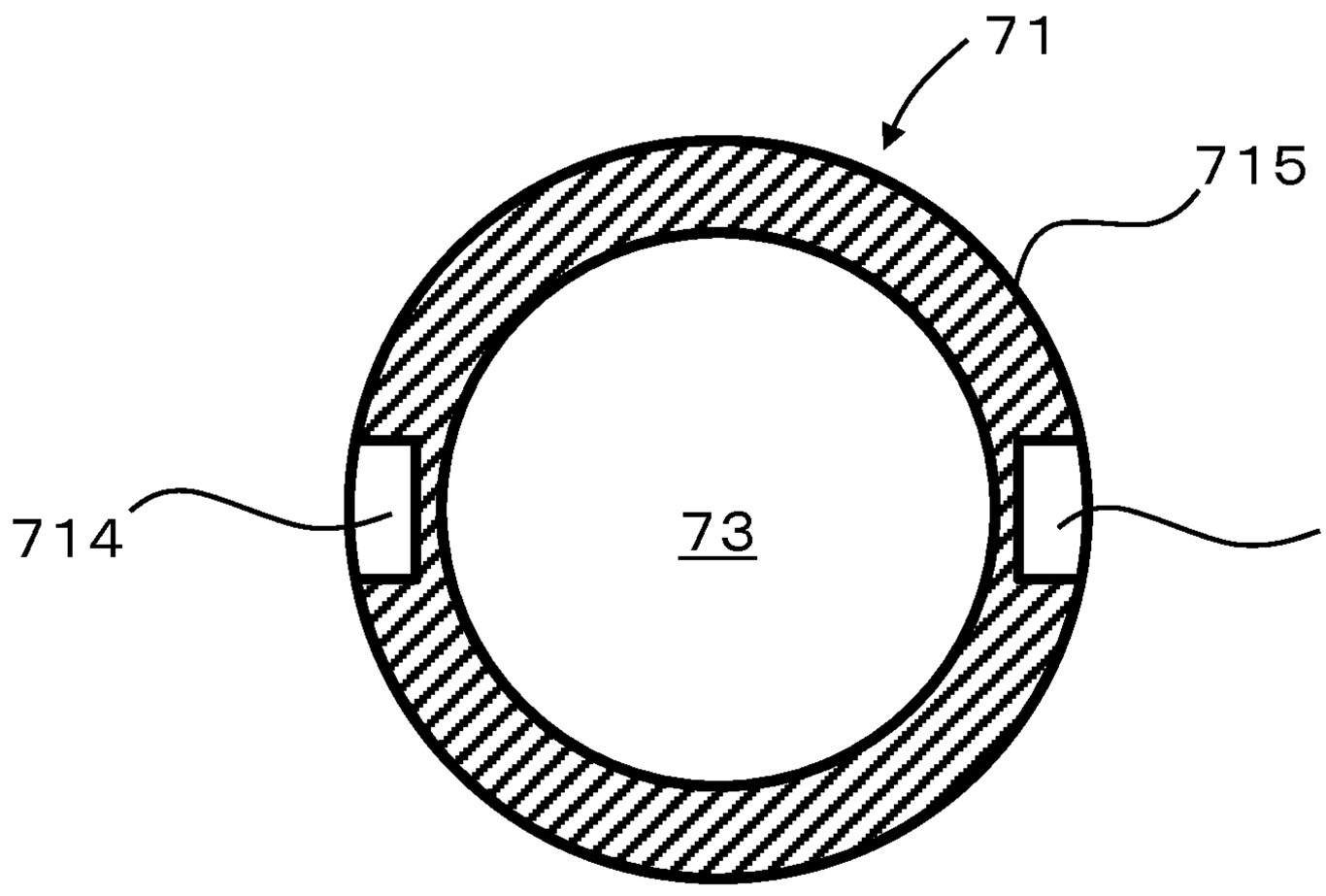
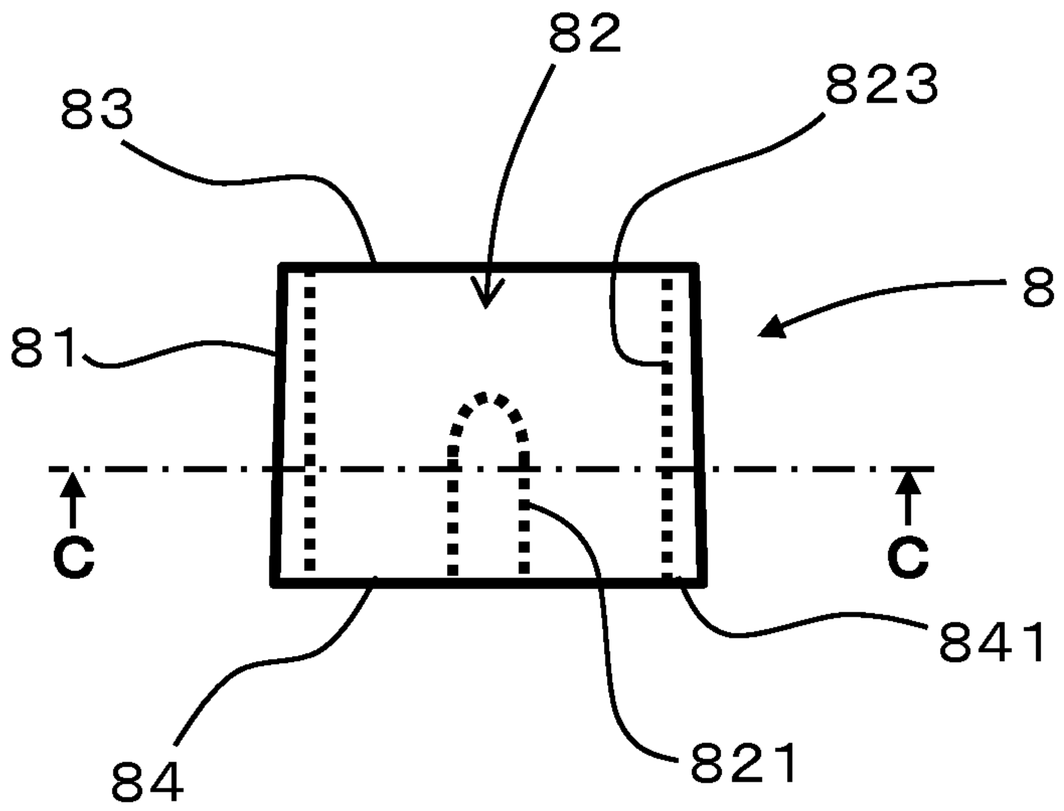


FIG.6B



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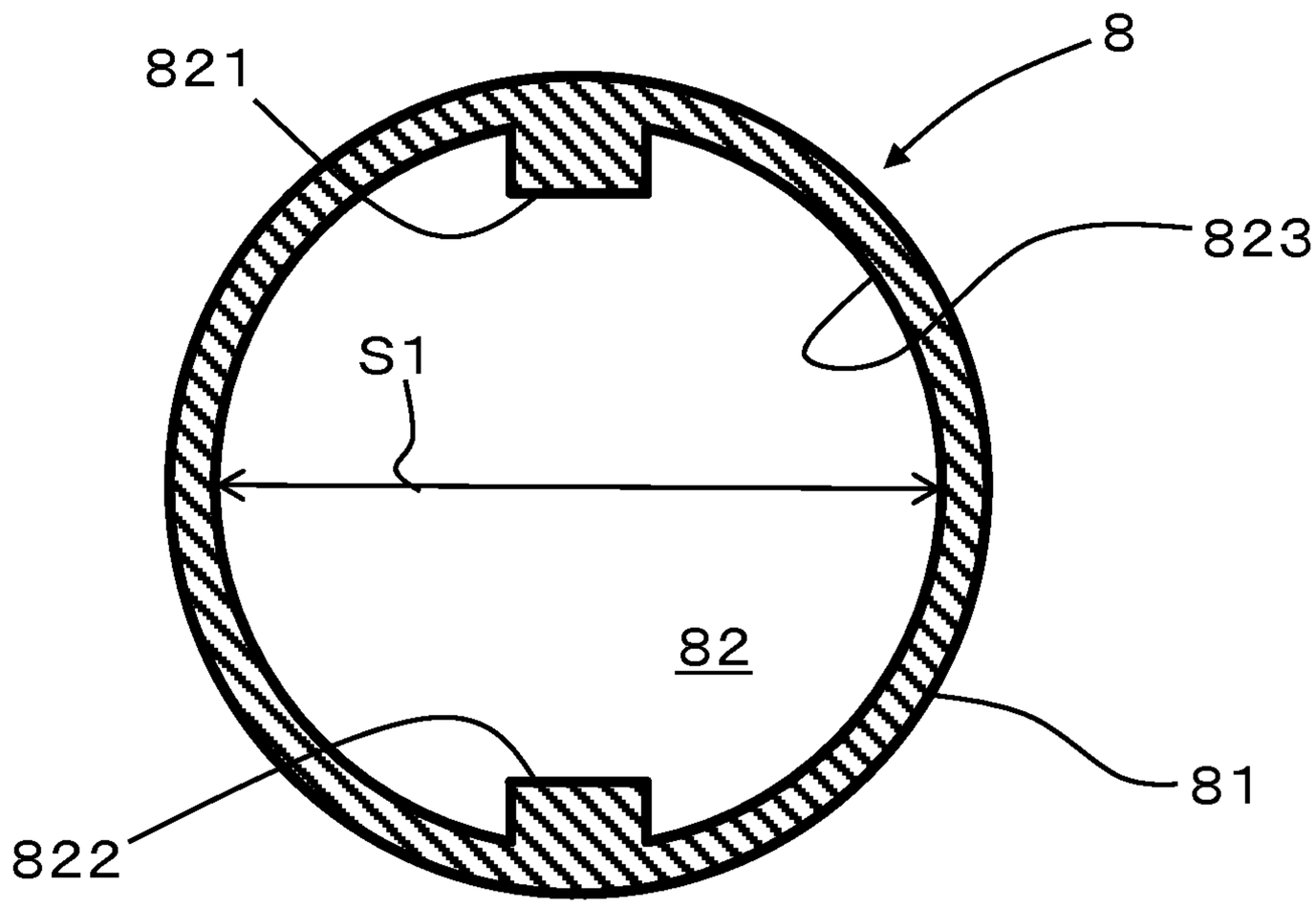

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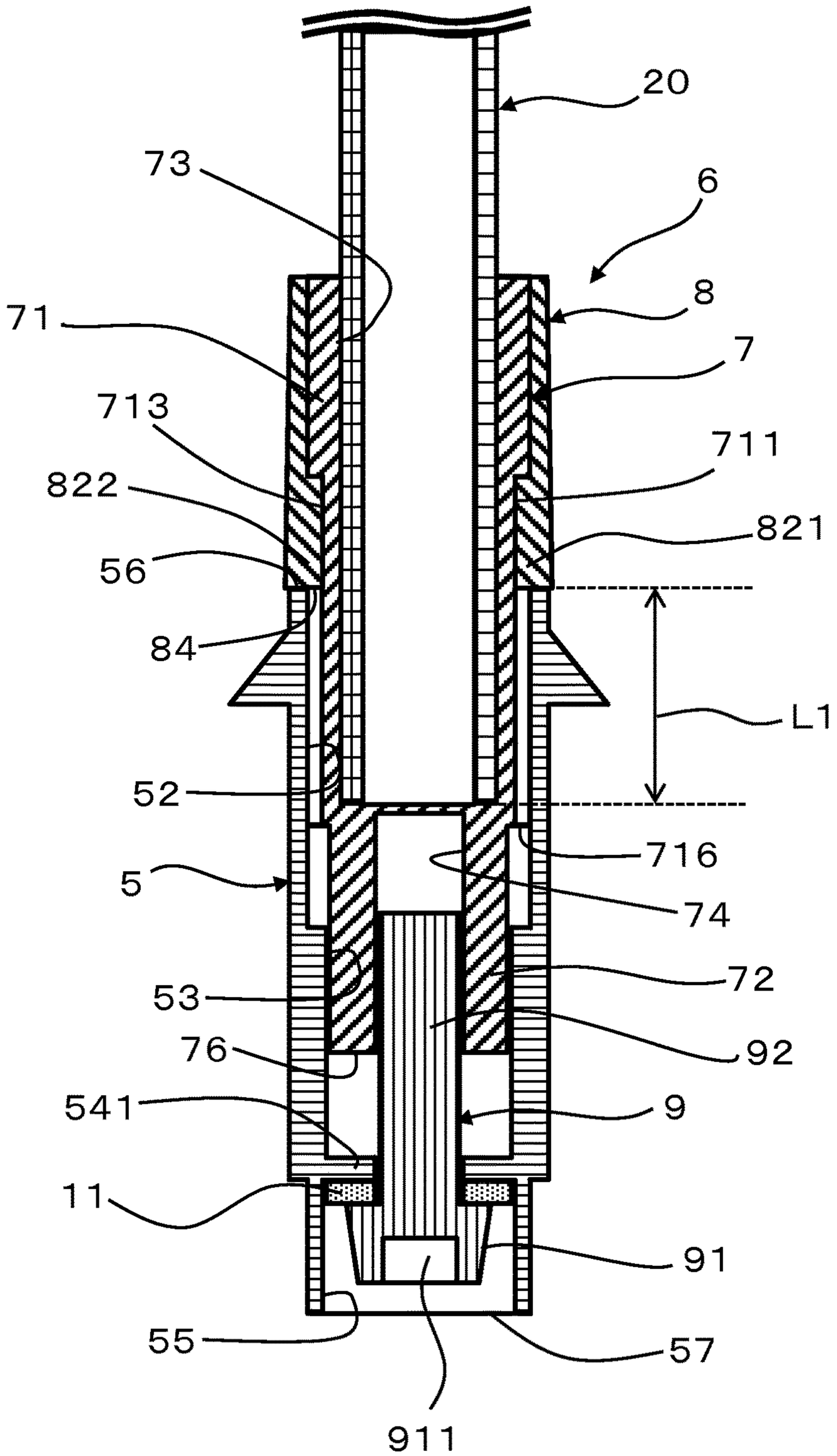
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FIG.9A

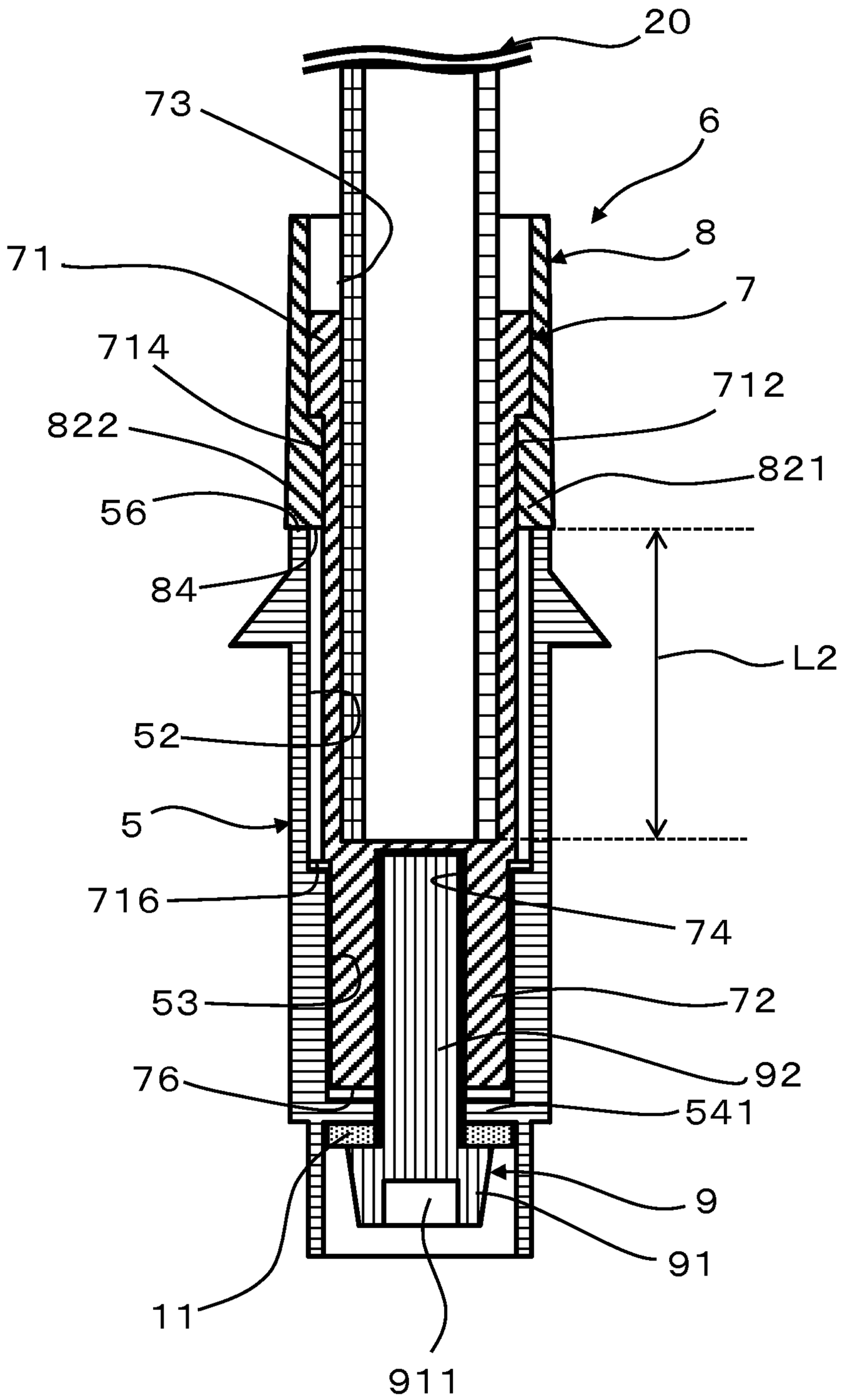
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FIG.9B

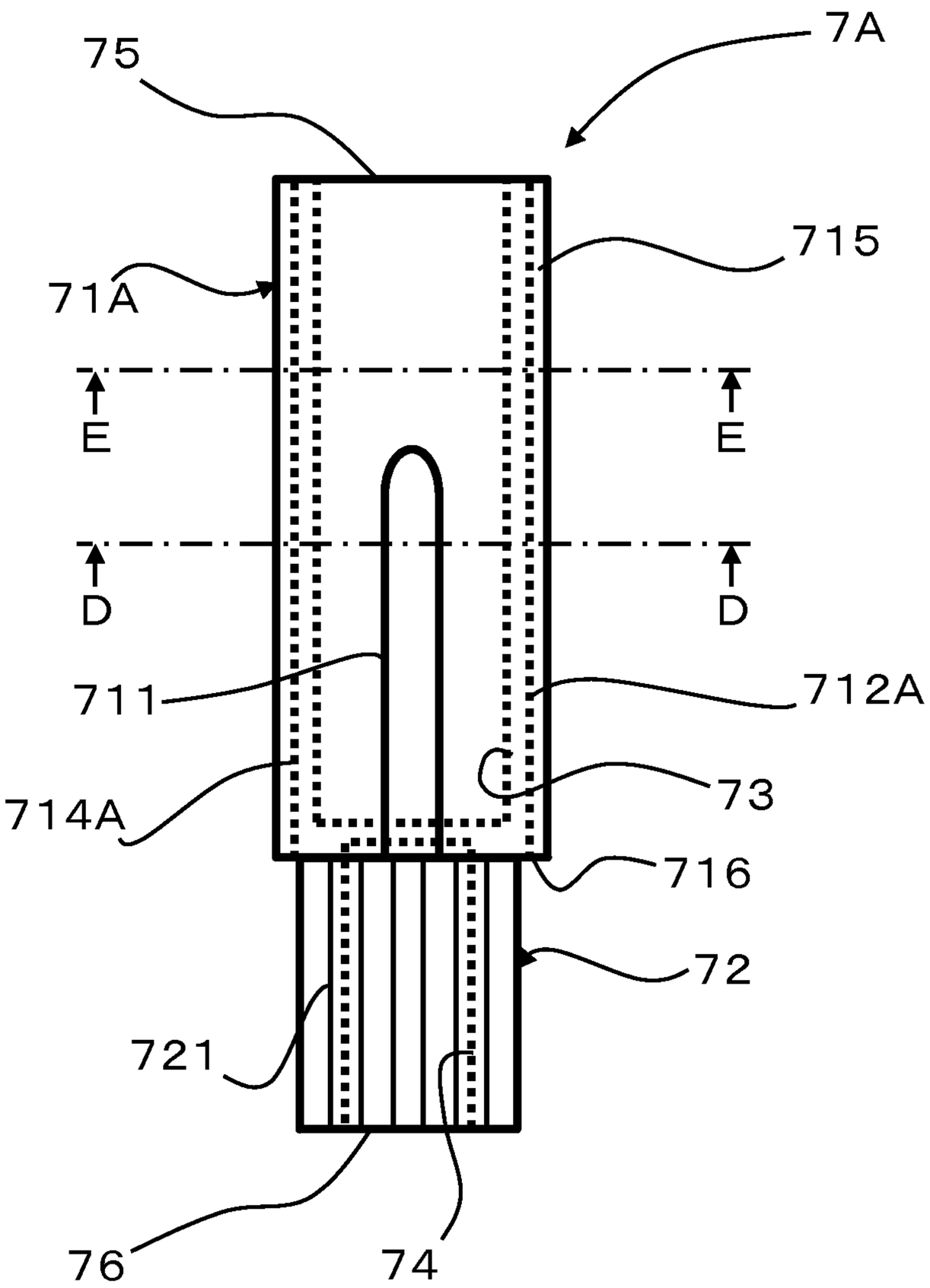

FIG.10A

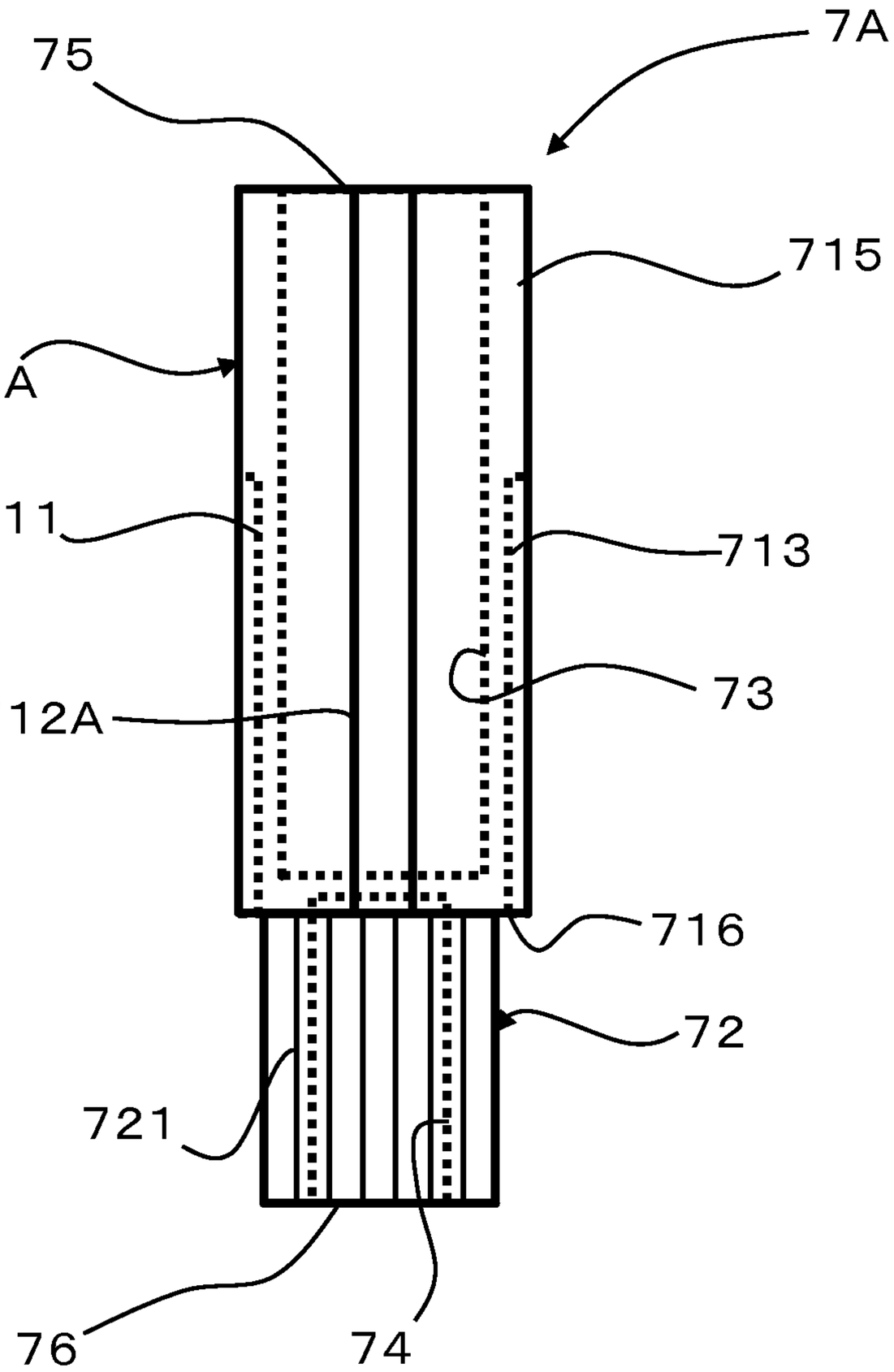

FIG.10B

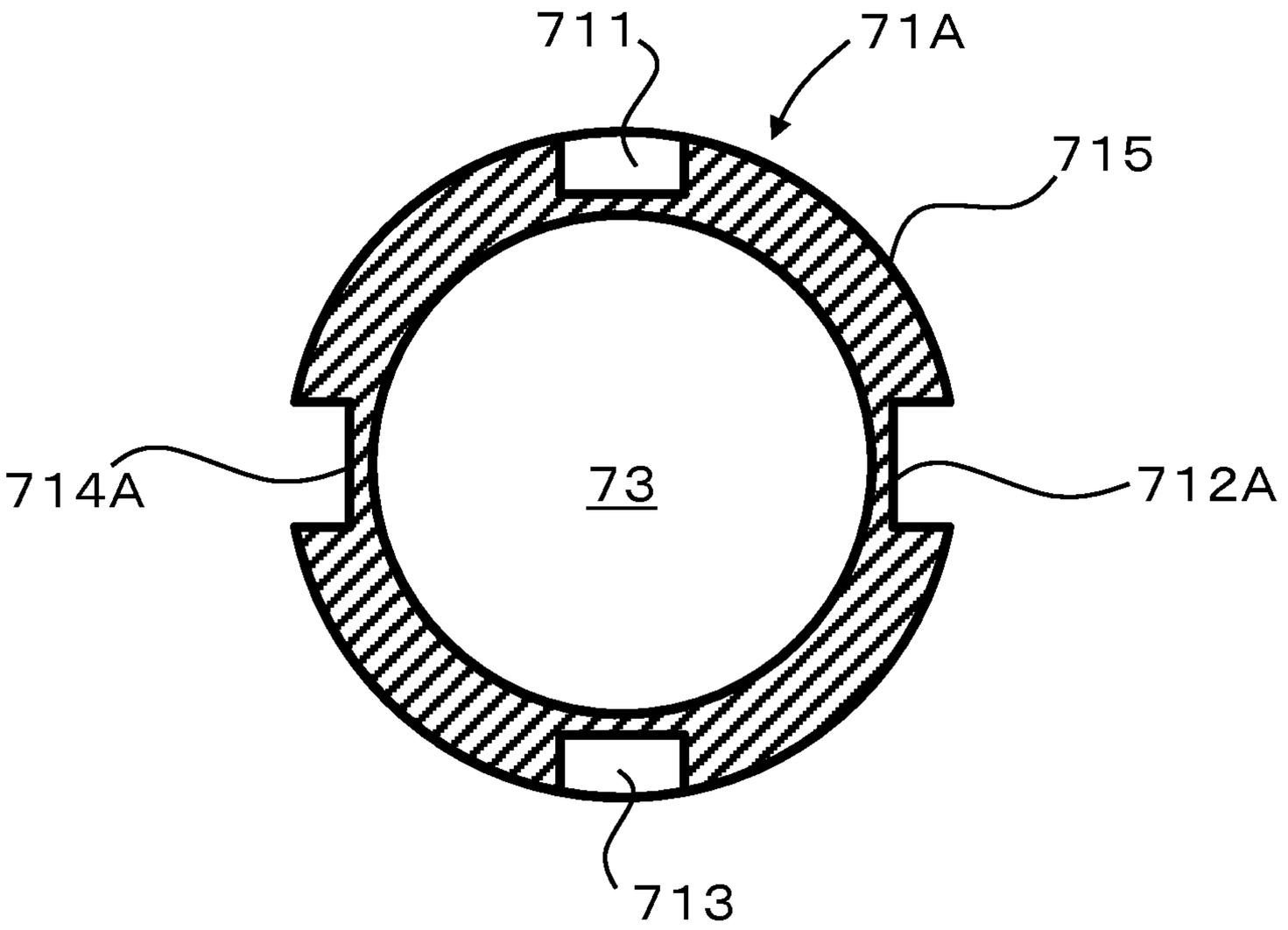

FIG.11A

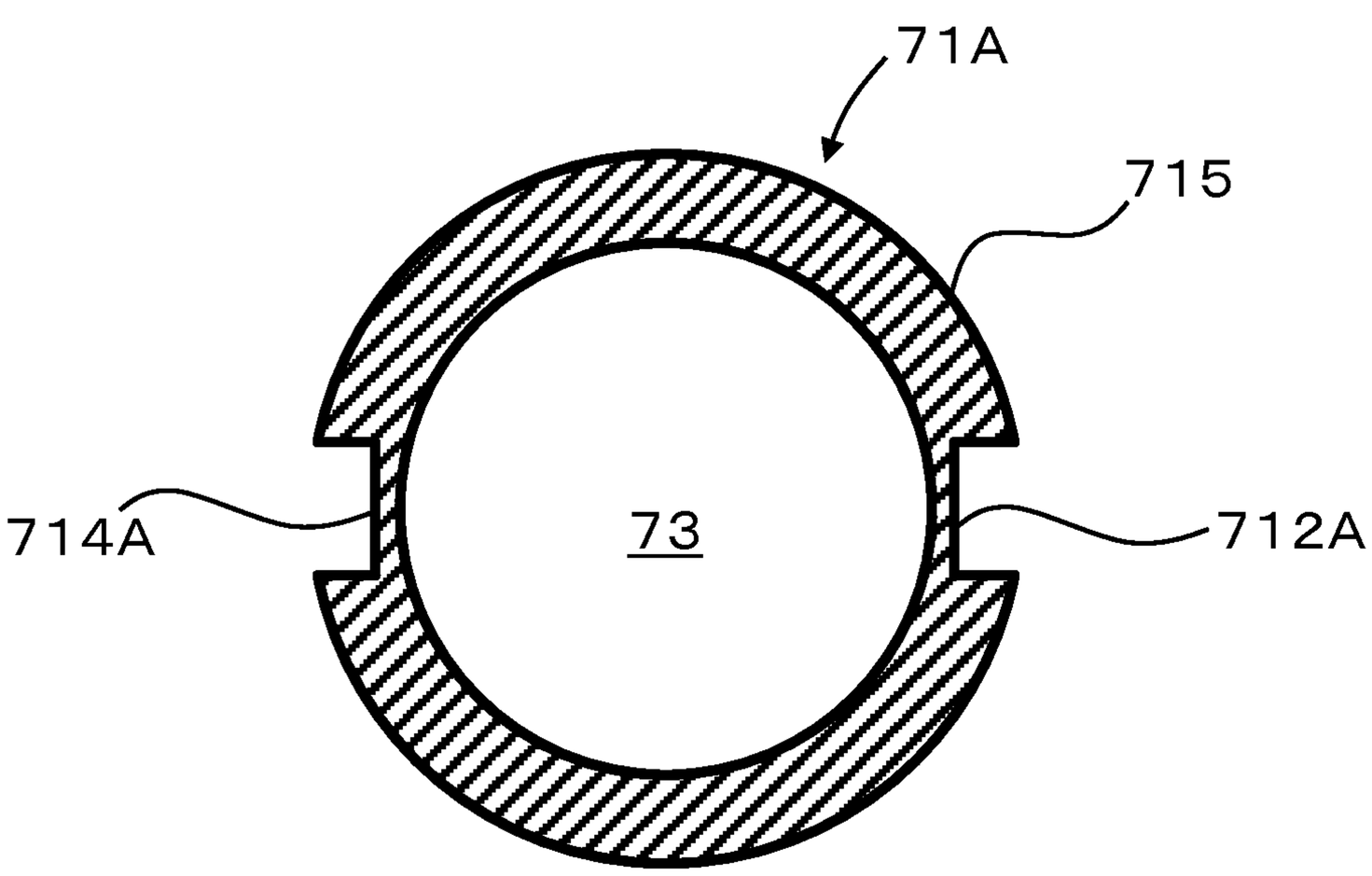

FIG.11B

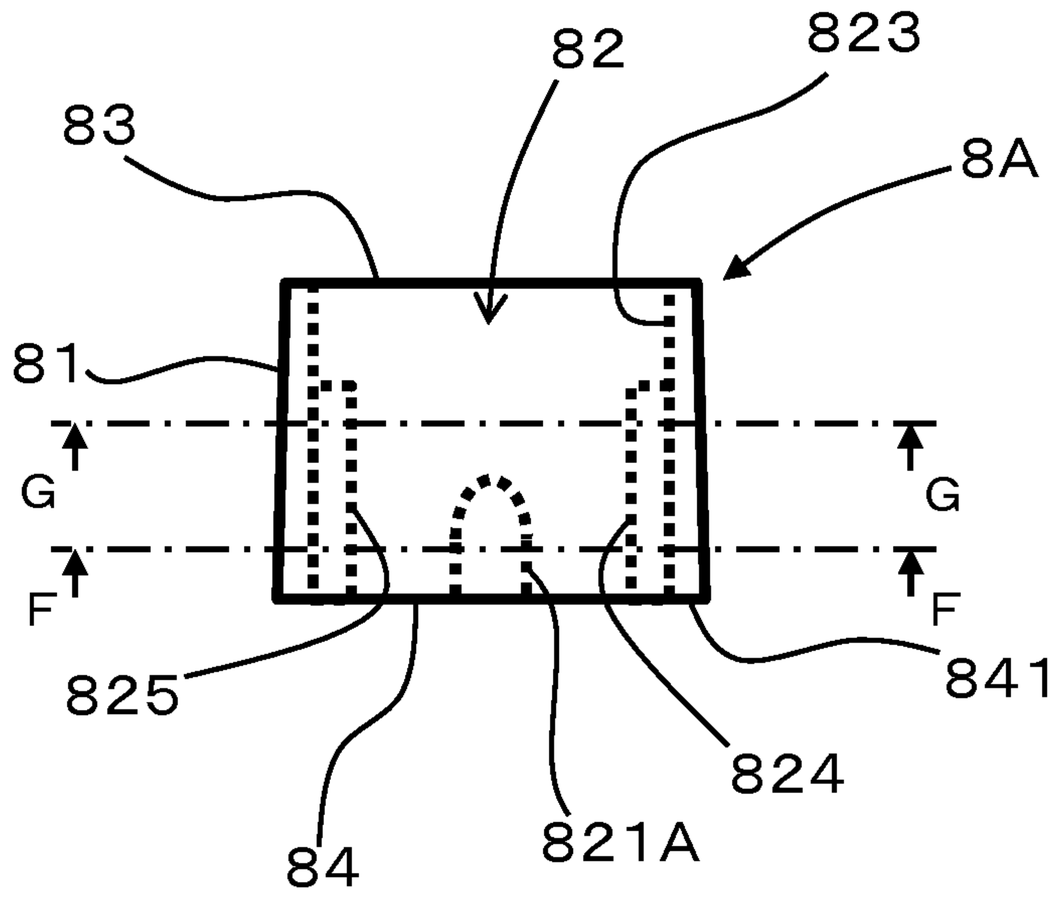

FIG.12A

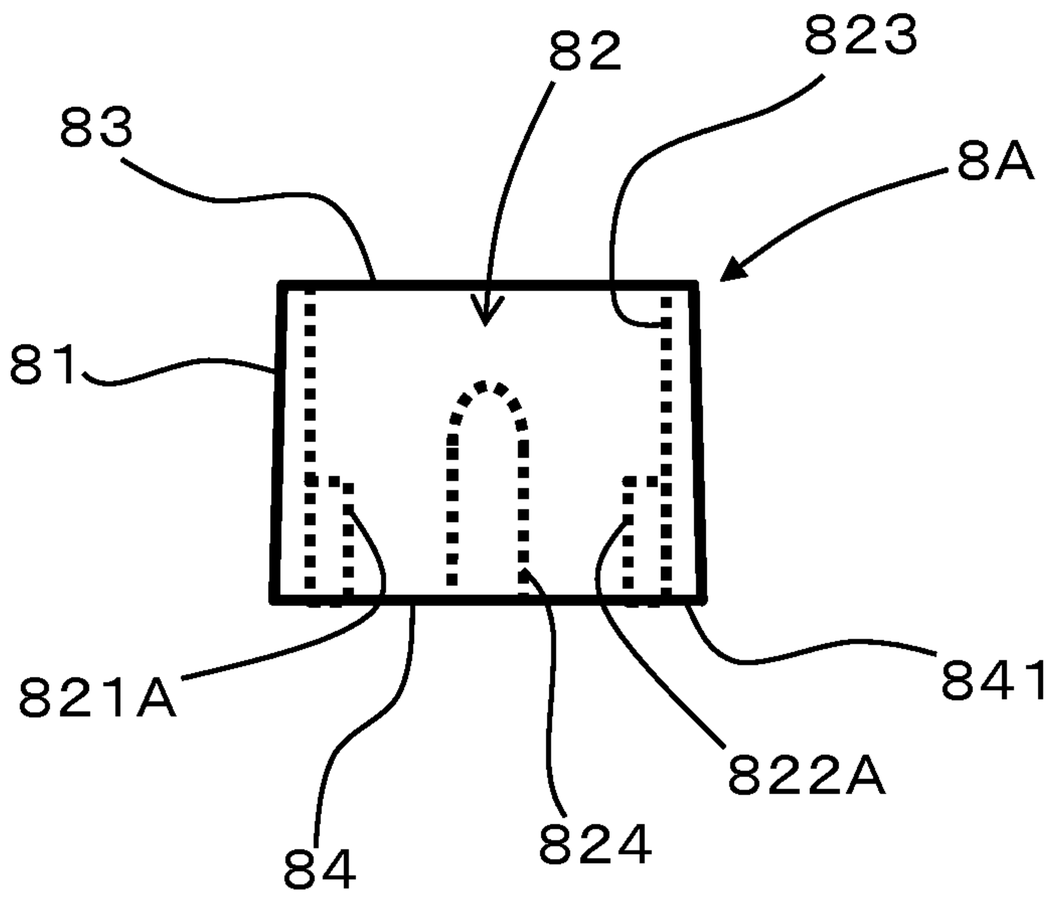

FIG.12B

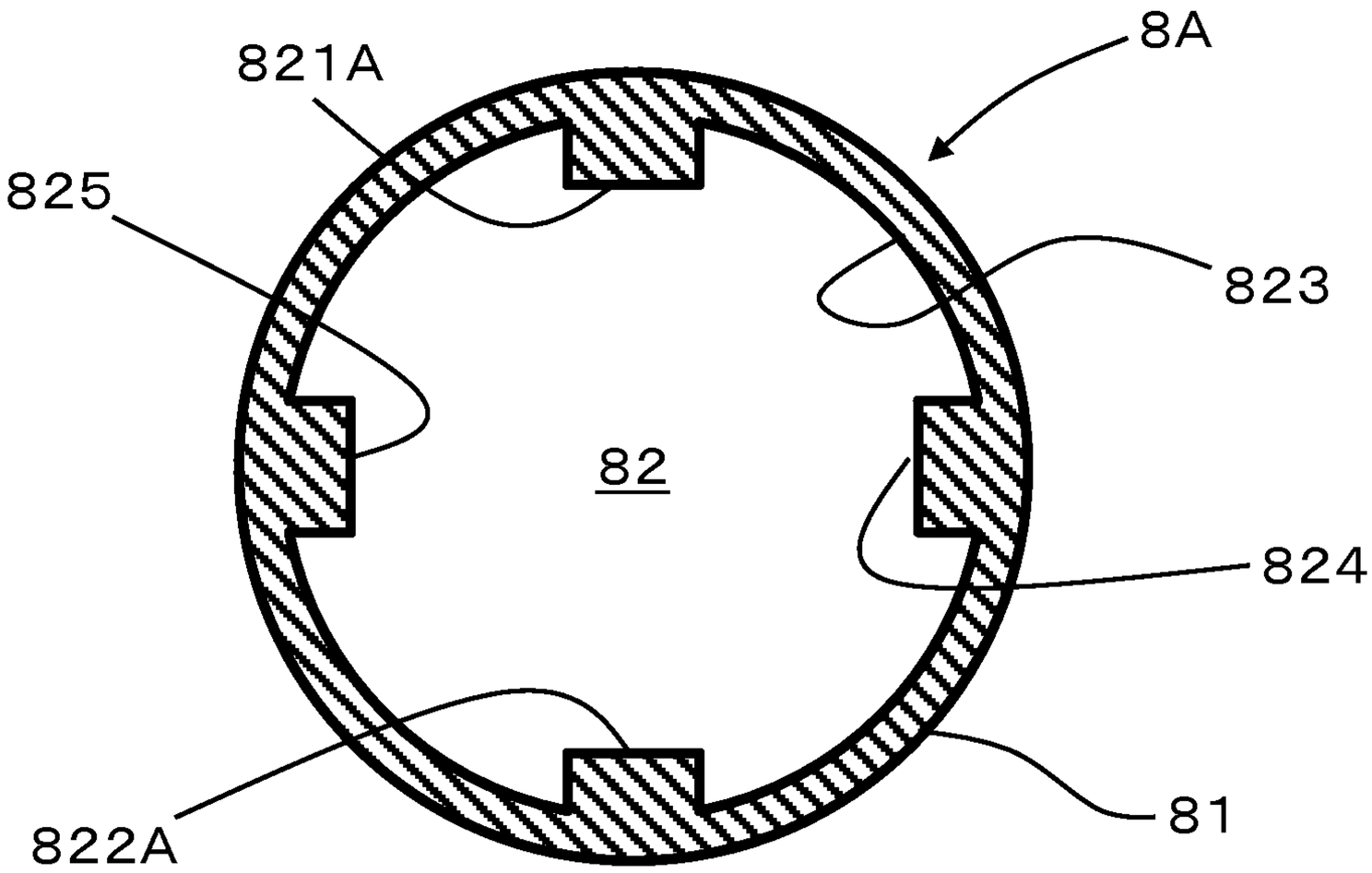

FIG.13A

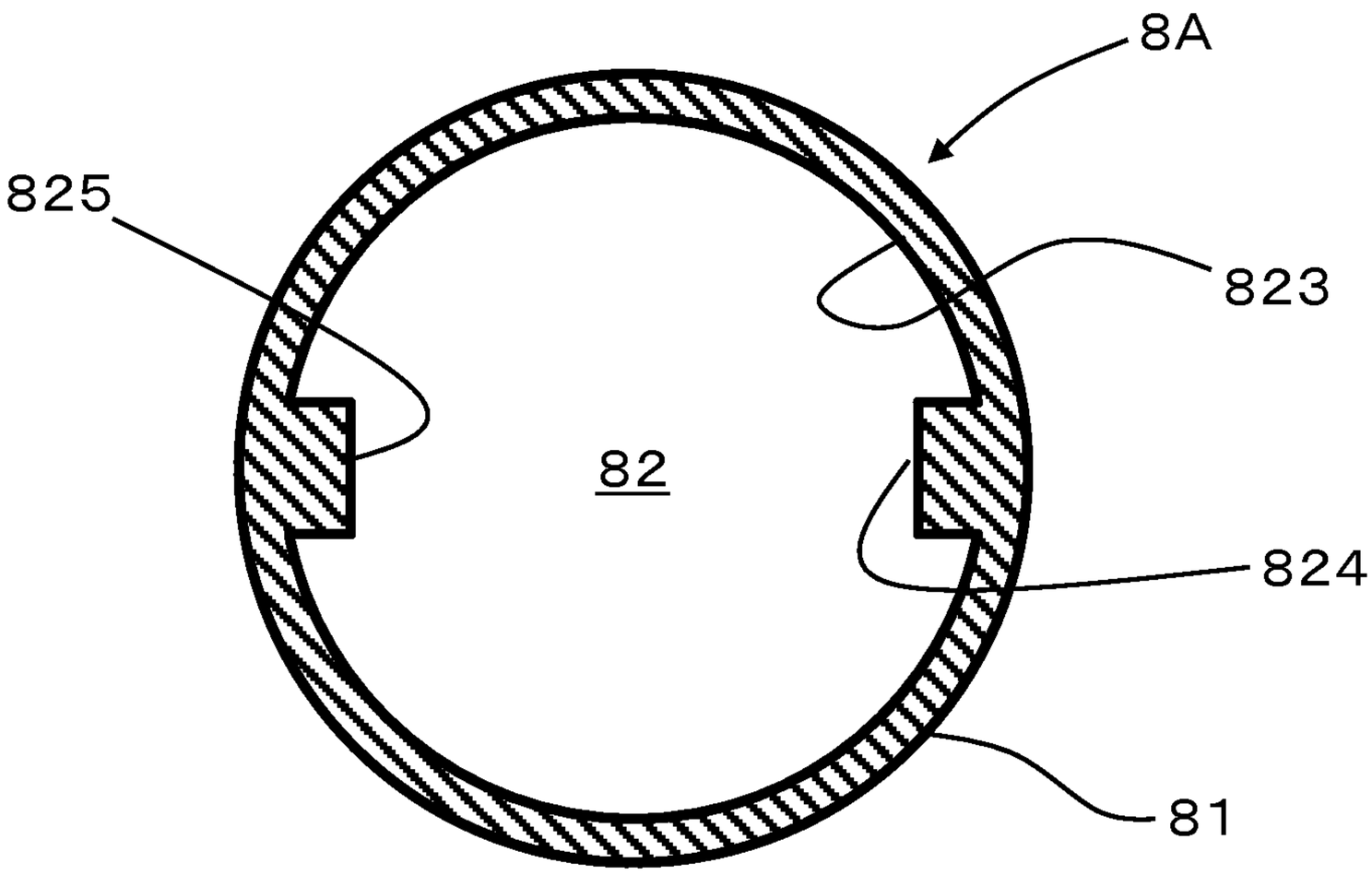

FIG.13B

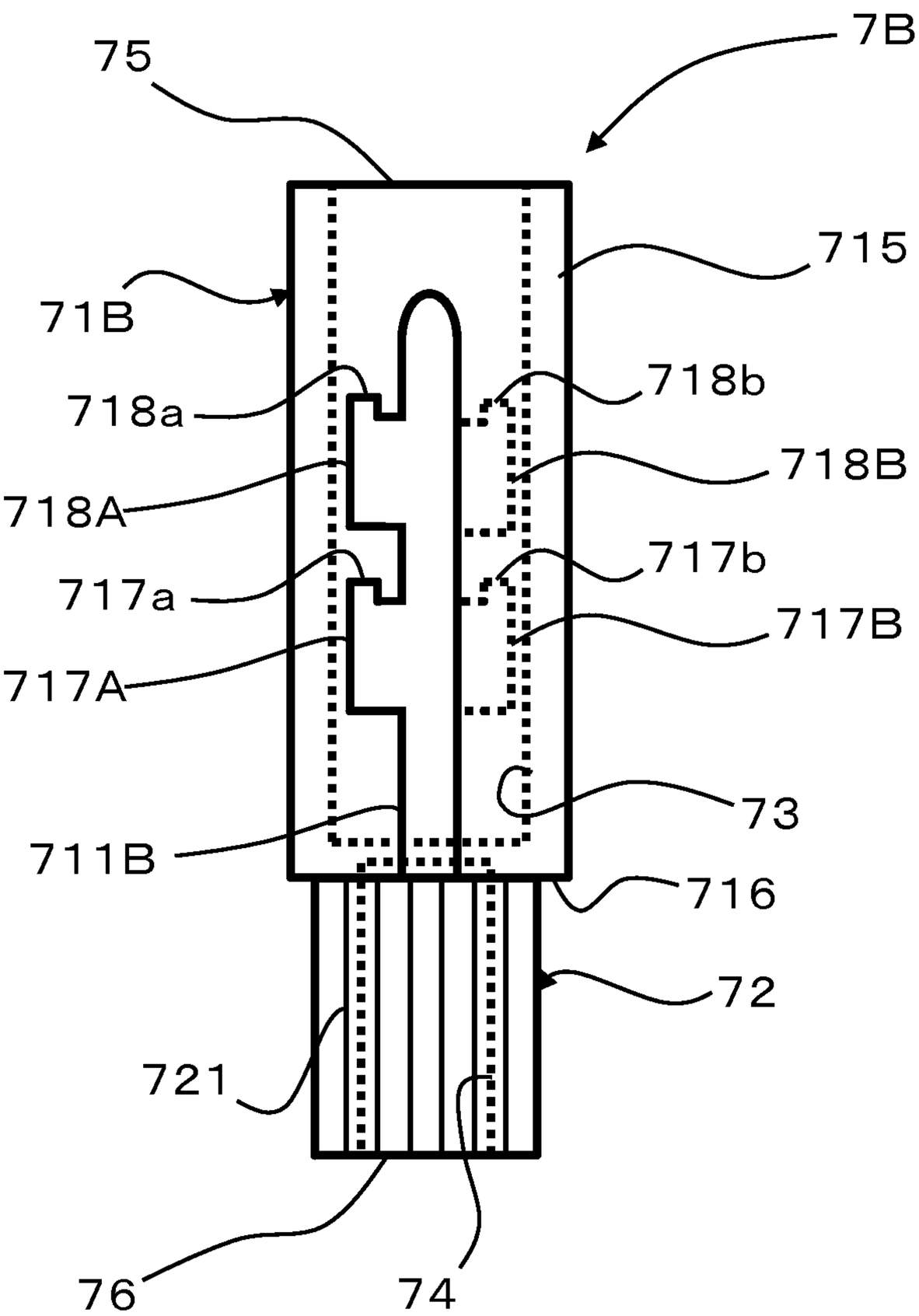
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FIG.14

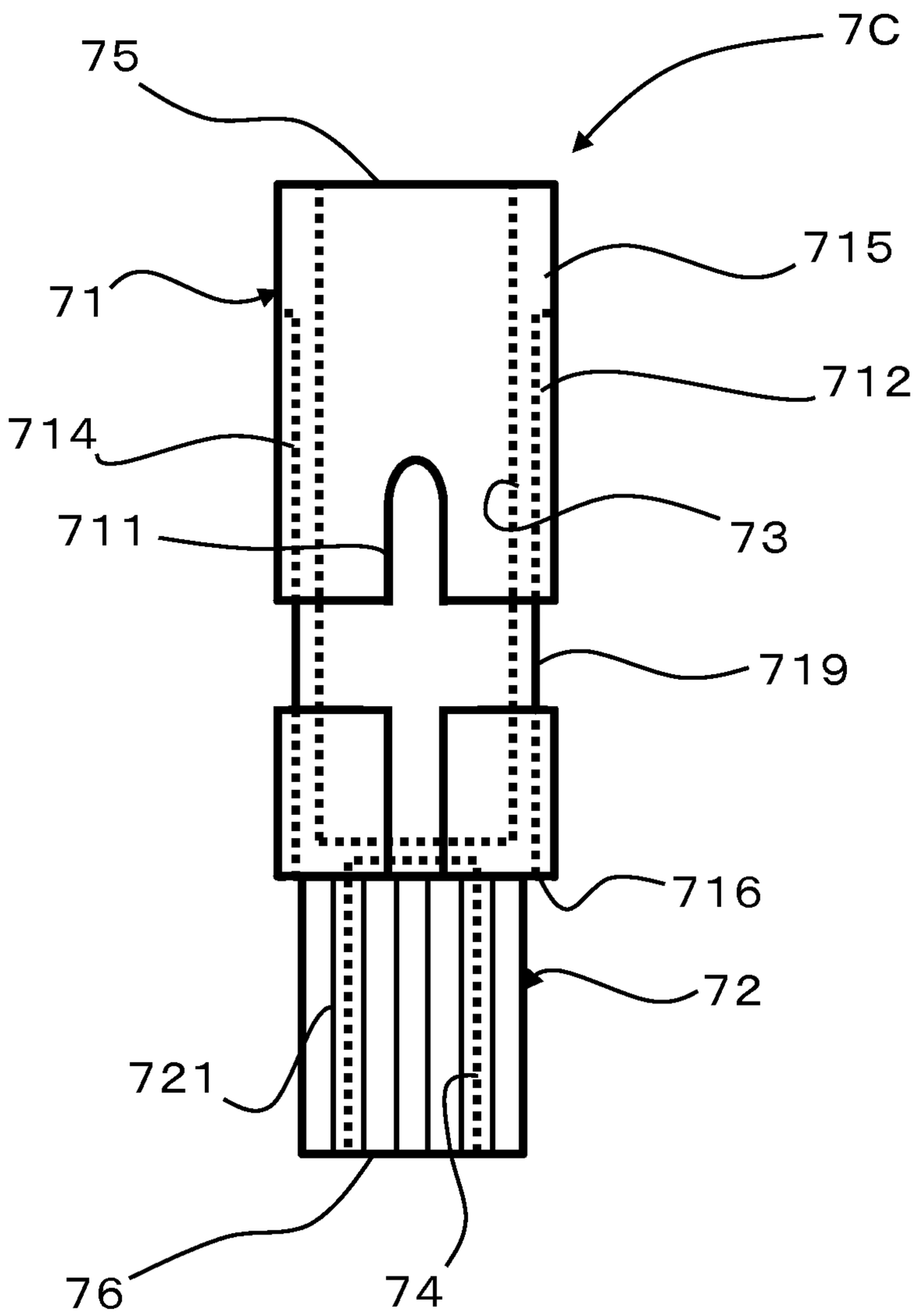

FIG.15

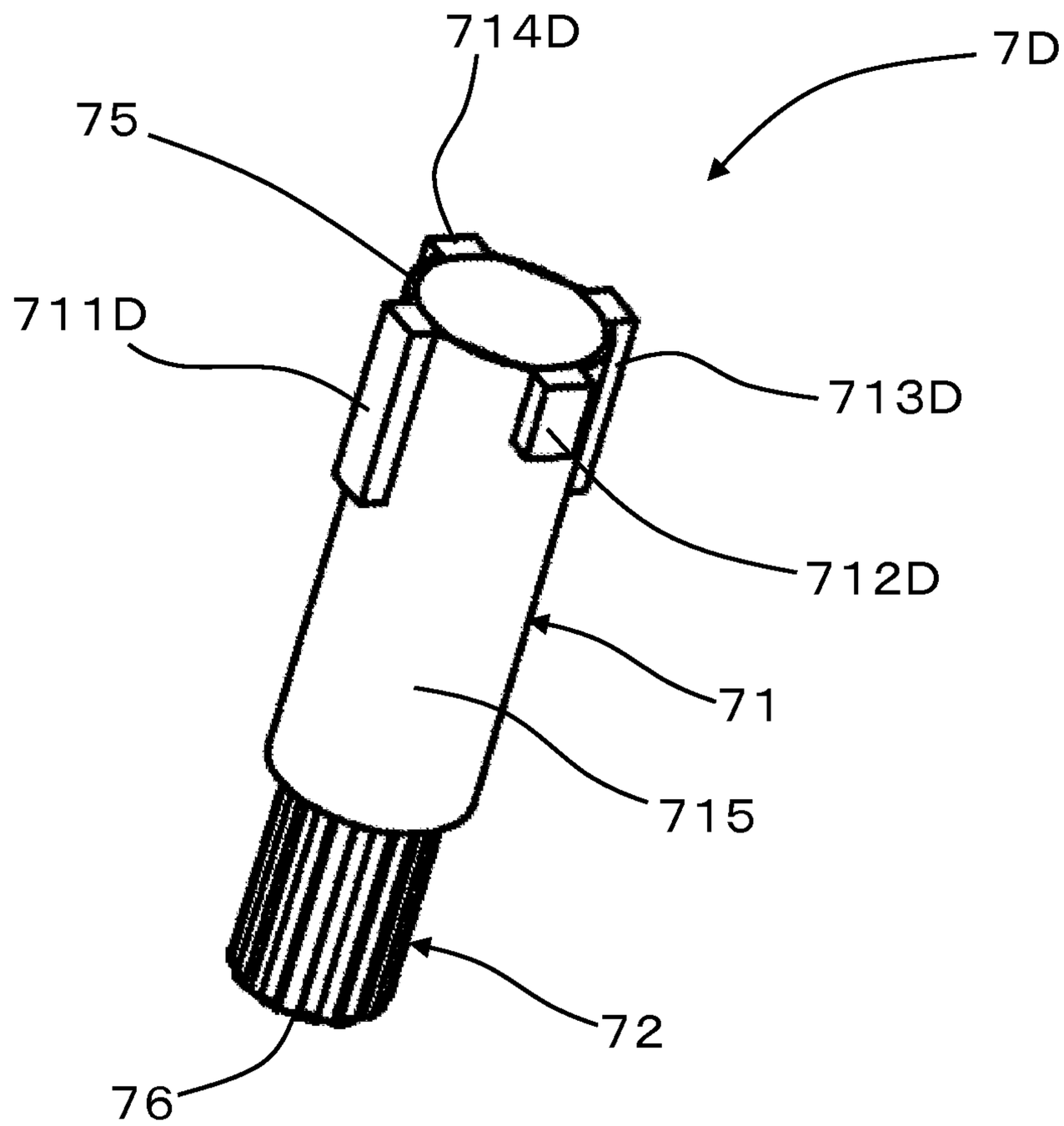

FIG.16A

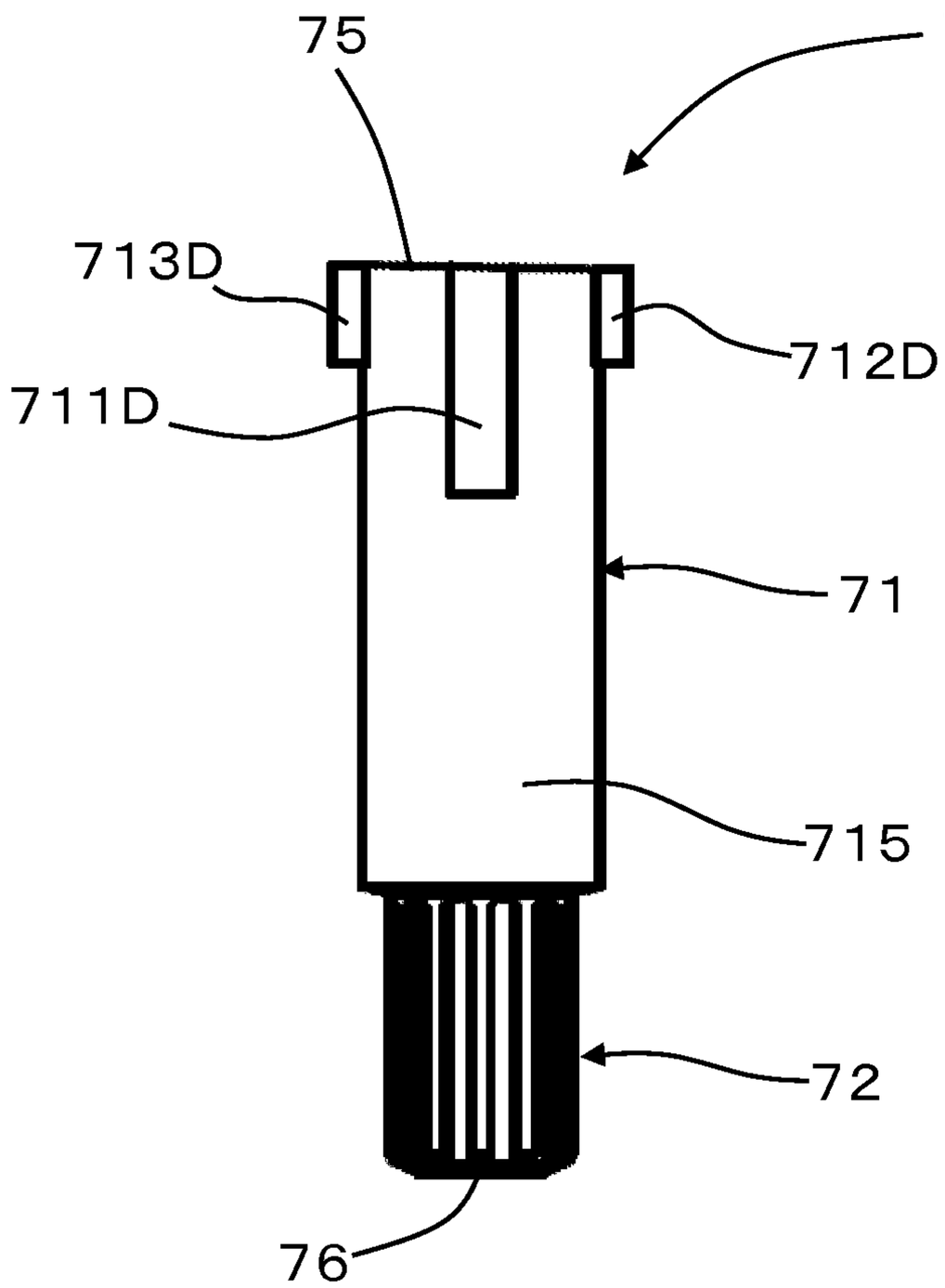

FIG.16B

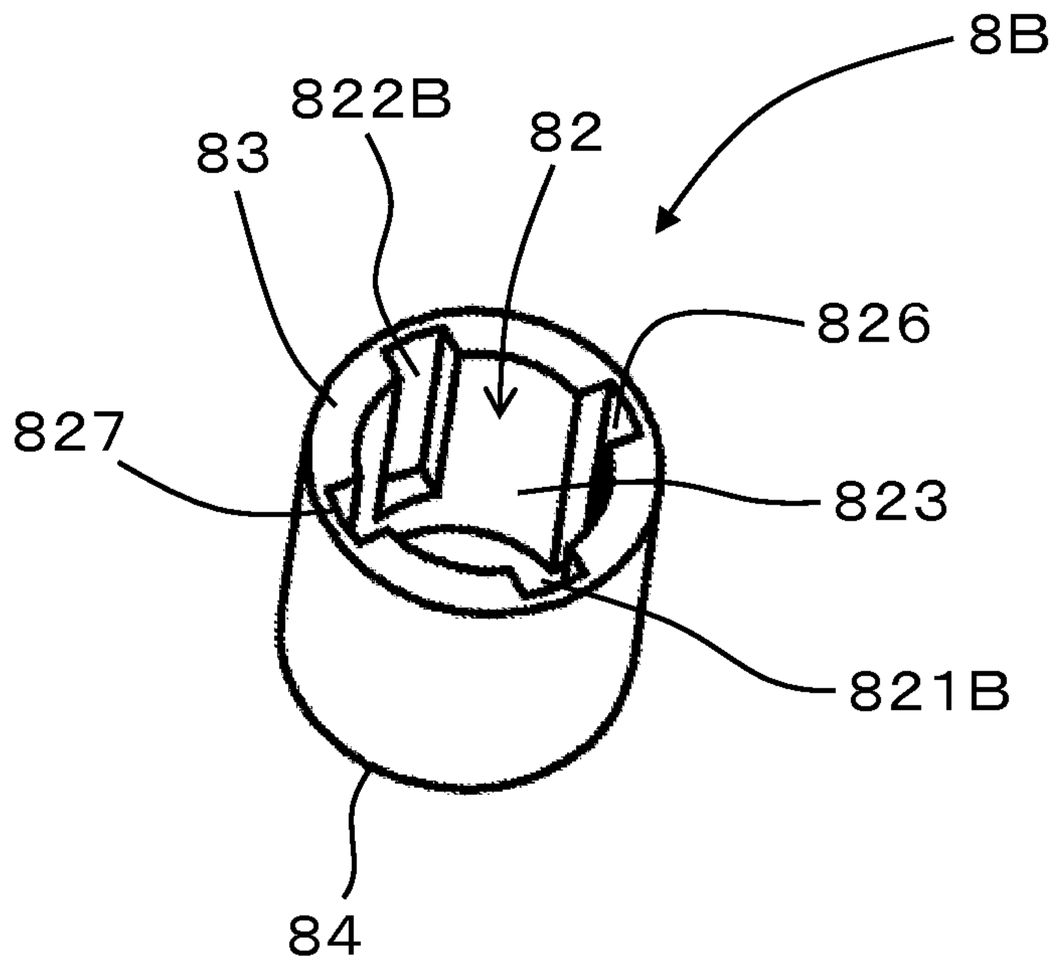

FIG.17A

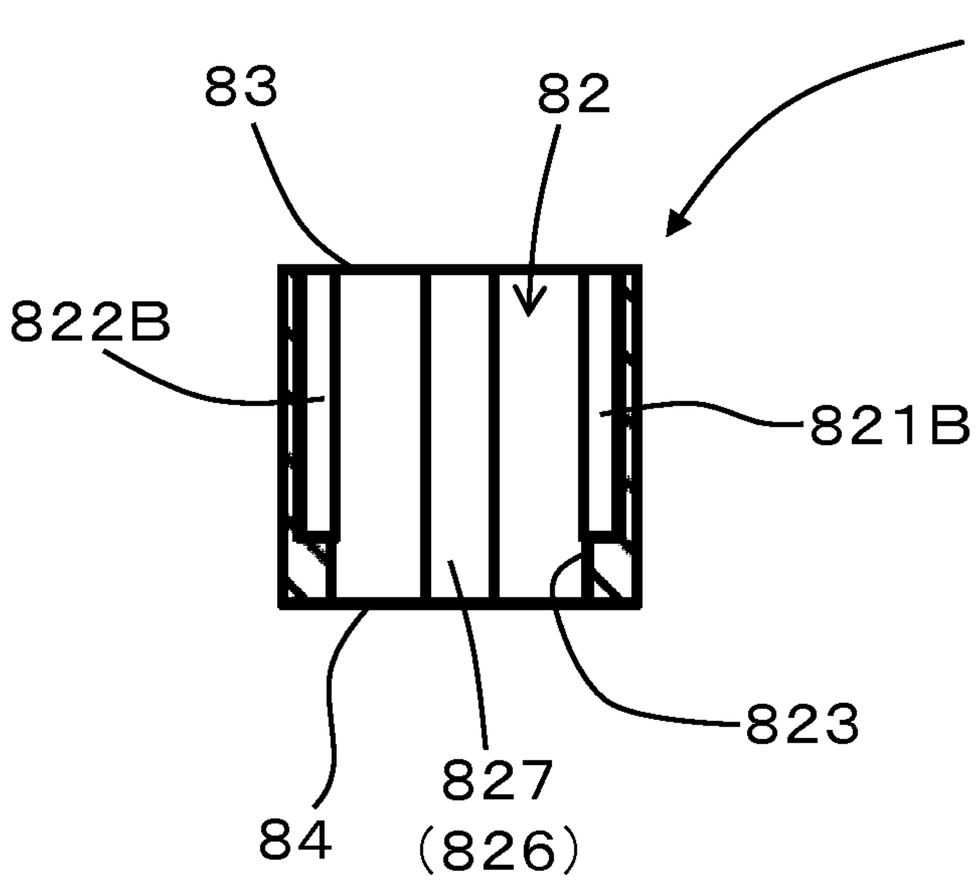

FIG.17B

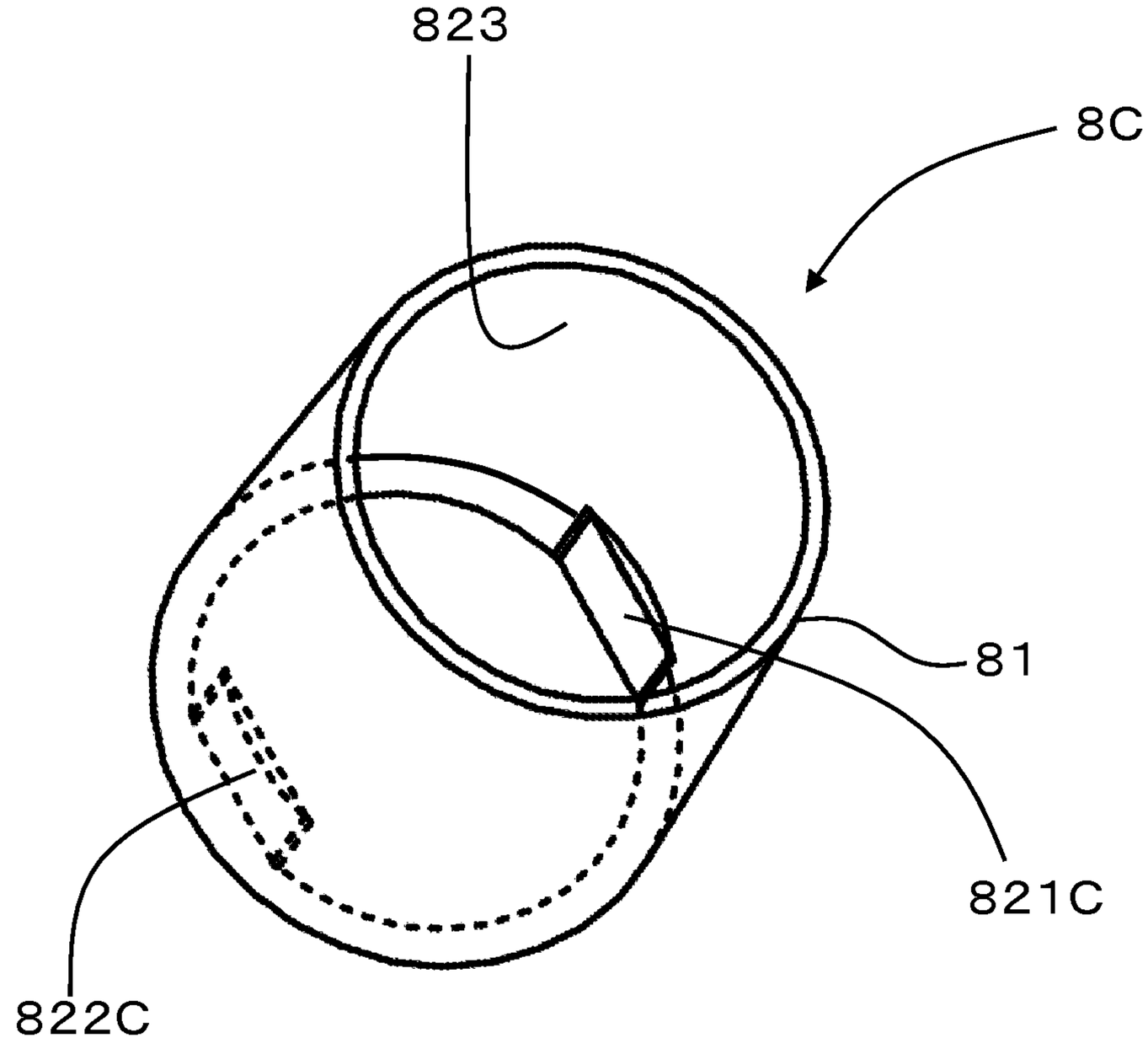

FIG.18A

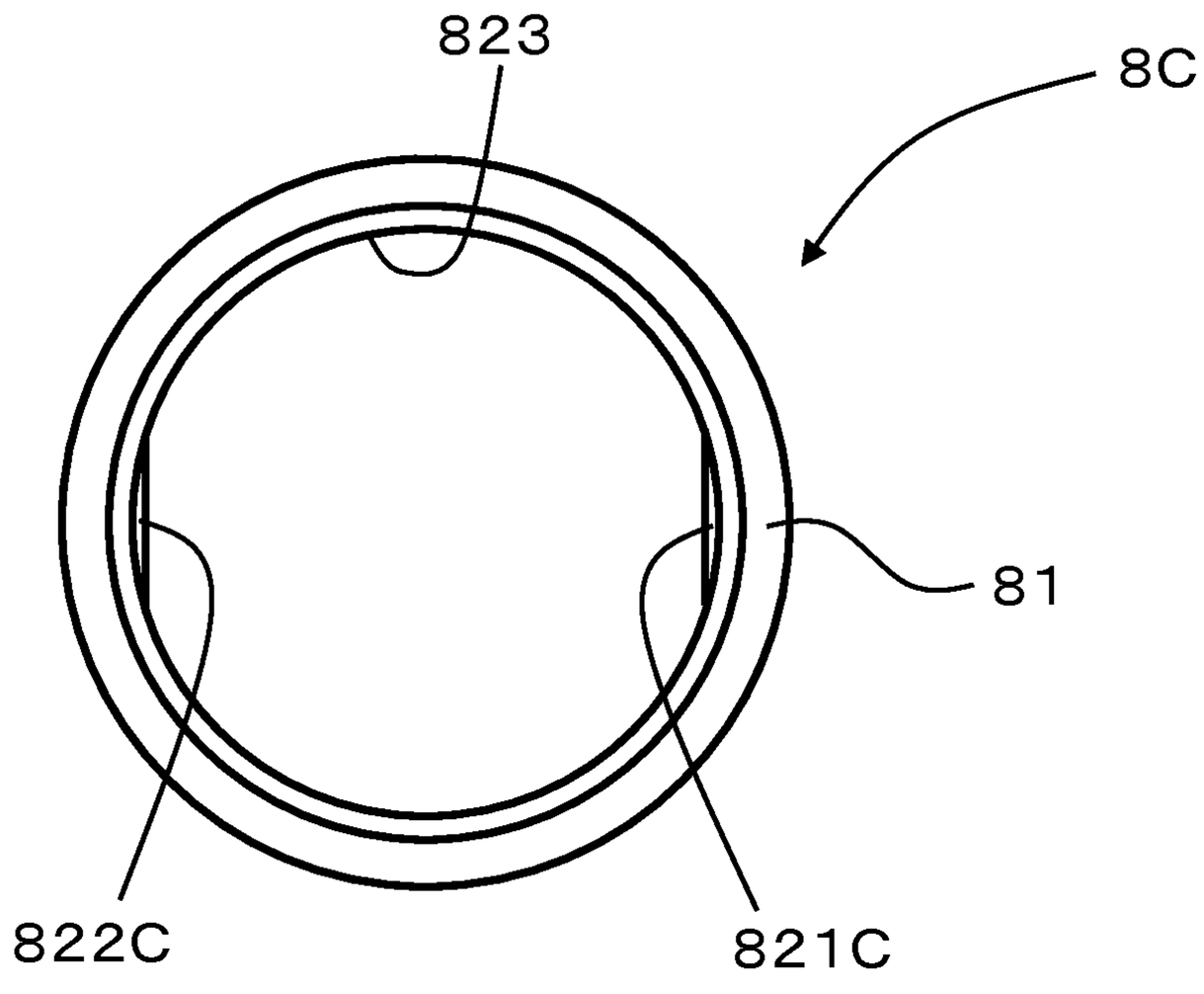

FIG.18B

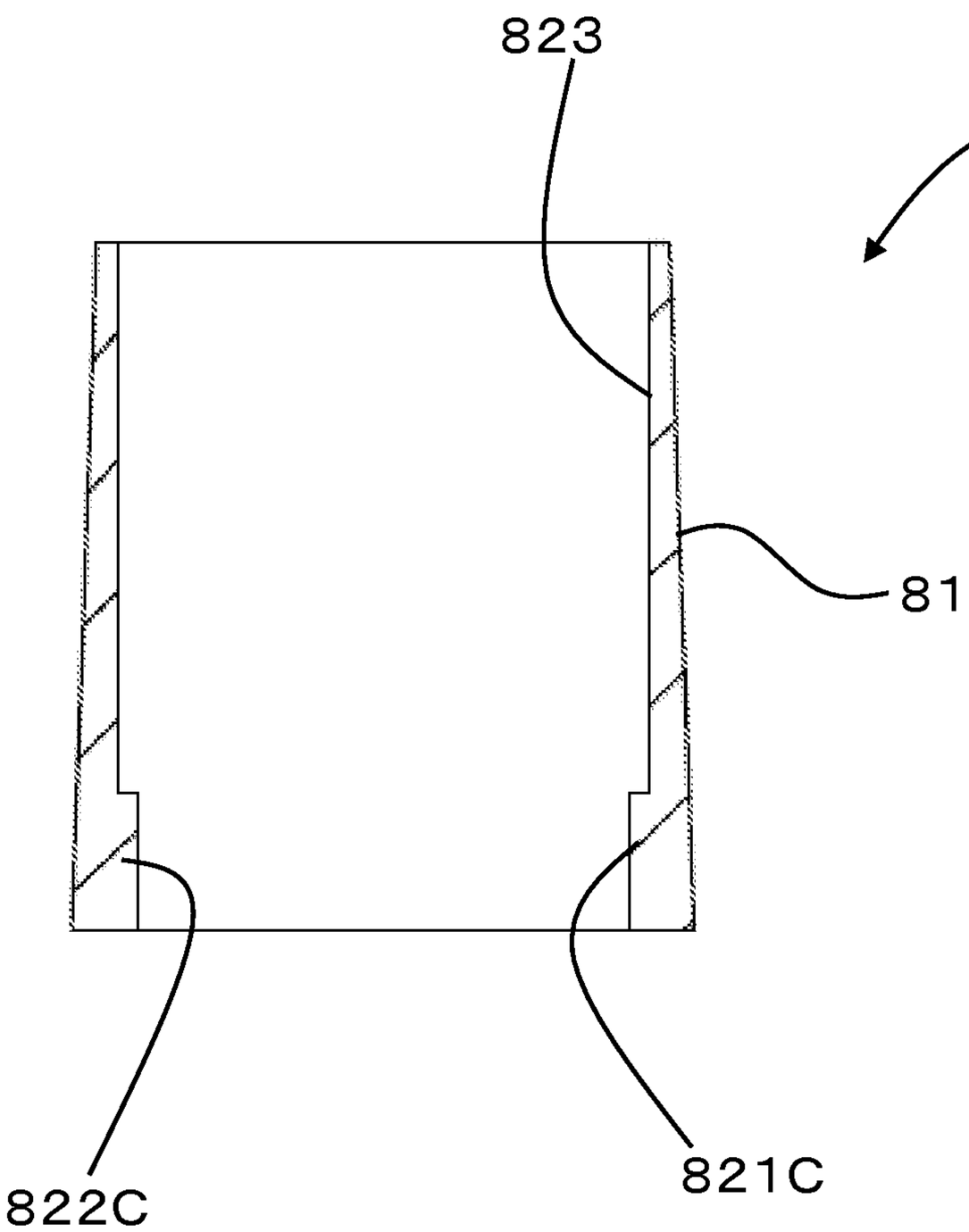

FIG.18C

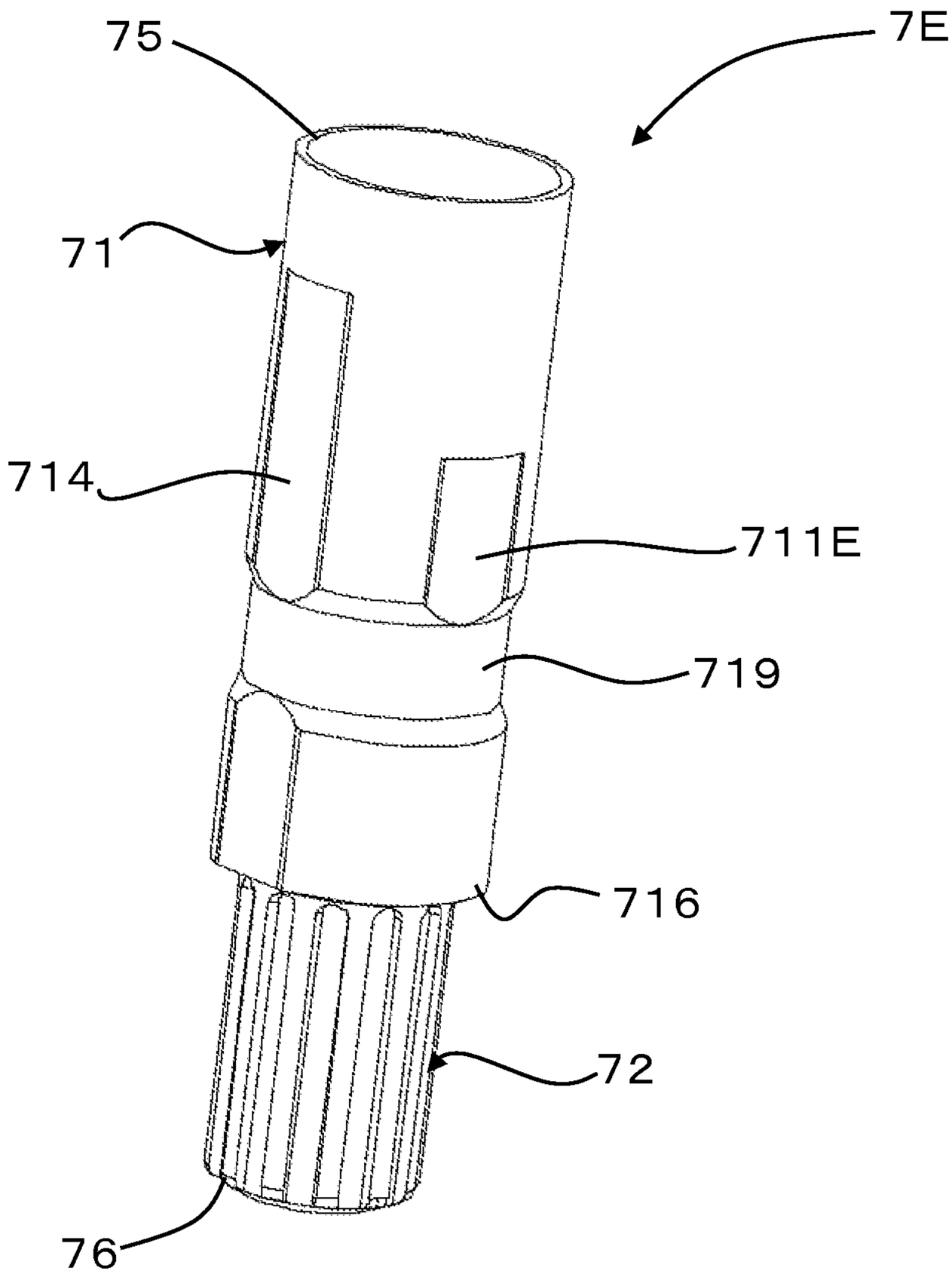

FIG.19

GOLF CLUB

CROSS REFERENCE

This application claims priority to Japanese Patent Application No. 2014-128933 filed on Jun. 24, 2014, which is hereby incorporated by reference in its entirety.

FIELD

The present invention relates to a golf club.

BACKGROUND

A variety of methods for joining a golf club head and a shaft together have been proposed over the recent years. For example, a golf club (Japanese Patent Application Laid-Open Publication No. 2008-029691) exists, which is configured to make variable a length from a grip to a golf club head (which will hereinafter be also termed a "club length") by enabling a variation of a depth at which the shaft is inserted into a hosel.

This golf club is specifically configured as below. A cylindrical collar member is attached to a tip of the shaft. Two engaging protrusions are provided at spacing through 180 degrees on an outer peripheral surface of the collar member. On the other hand, the golf club head is provided with a hosel including a shaft securing hole. An upper inner peripheral surface of the shaft securing hole is formed with two recessed portions each having a first through third stepped receiving portions to receive the engaging protrusions of the collar member in an axial direction.

To be specific, the receiving portions are different in axis-directional position to receive the engaging protrusions. The depth (an axis-directional length) at which the shaft is inserted into the hosel can be therefore adjusted by selecting the receiving portion to receive the engaging protrusion of the collar member in the axial direction while rotating the shaft in a periaxial direction. This contrivance enables the golf club to vary the club length.

SUMMARY

The golf club is configured to secure the shaft in the axial direction by inserting the collar member formed with the engaging protrusions into the shaft securing holt of the hosel, and causing the engaging protrusions of the collar member to abut on the receiving portions of the shaft securing hole. Consequently, a problem is that a portion (neck) for joining the golf club head and the shaft together has a diameter resulting in an increase corresponding to a dimension for forming the recessed portion to receive the engaging protrusion.

A golf club according to one aspect of the present invention includes a shaft, a golf club head including a hosel containing a hole to attach the shaft, and a sleeve system to including a body attached to a tip of the shaft and inserted together with the shaft into the hole of the hosel and an adaptor attached to the body so as to enable an adjustment of an axis-directional position with respect to the body and engaging with an upper end of the hosel.

The golf club having the configuration described above includes the sleeve system attached to the tip of the shaft, the sleeve system containing the body and the adaptor. The body of the sleeve system is inserted into the hole of the hosel, while the adaptor engages with the upper end of the hosel. The shaft of the golf club having the configuration described above is thereby secured in the axial direction. To be specific, a depth at which the shaft is inserted into the hosel, in other words, a position for securing the shaft in the axial direction is specified based on a position of the adaptor with respect to the body in the axial direction.

The adaptor of the golf club having the configuration described above is configured to make a position of its being attached to the body adjustable in the axial direction. The configuration described above therefore enables a variation of the club length by adjusting the axis-directional position of the adaptor with respect to the body and also adjusting an axis-directional securing position of the shaft.

With the configuration described above, the adaptor engages with the upper end of the hosel, thereby specifying the axis-directional securing position of the shaft. In other words, the system for specifying the axis-directional securing position of the shaft is provided in not an interior but an exterior of the hole of the hosel, and can therefore restrain a diameter of a neck from increasing. With the configuration described above, it is feasible to provide a golf club configured to enable the club length to vary with a simple structure so as not to increase the diameter of the neck.

In another mode of the golf club according to one aspect, the adaptor may be configured in a cylindrical shape so as to attach to an outer peripheral surface of the body. An inner peripheral surface of the adaptor may be formed with engaging portions extending in an axial direction. A plurality of engaged portions, with which the engaging portions of the adaptor engage in a rotation-disabled manner in a periaxial direction, may be formed in an outer peripheral surface of the body. Further, the engaging portion selectively may engage with one of the plurality of engaged portions to enable the adaptor to vary the axis-directional position with respect to the body. The adaptor may be configured not to come off the body in such a direction as to separate from the hosel upon engagement of the engaging portion of the adaptor with one of the plurality of engaged portions. With the configuration described above, it is feasible to provide the sleeve system with a simple structure to make the adaptor detachably attachable in the axial direction.

Note that the engaging portion formed on or in the inner peripheral surface of the adaptor may be configured as a protrusion protruding inward, e.g., in a radial direction and may also be configured as a groove being recessed outward in the radial direction. With the engaging portion being configured as the protrusion, the engaged portion formed in the outer peripheral surface of the body may also be configured as a groove being recessed inward in the radial direction. With the engaging portion being configured as the groove, the engaged portion may also be configured as a protrusion protruding outward in the radial direction.

In still another mode of the golf club according to one aspect, the plurality of engaged portions maybe disposed at a spacing in a periaxial direction in the outer peripheral surface of the body. The engaged portions may be configured to differentiate axis-directional engagement positions with the engaging portions from each other. The configuration described above enables an adjustment of the axis-directional position of the adaptor with respect to the body by an operation as simple as varying a periaxial direction when attaching and detaching the adaptor to and from the body.

In yet another mode of the golf club according to one aspect, the body may include a first end portion and a second end portion at both ends in the axial direction, the second end portion being formed with an aperture to receive insertion of the shaft. The engaging portions may be configured

by protrusions protruding from the inner peripheral surface of the adaptor, and the plurality of engaged portions maybe configured by grooves extending in the axial direction in the outer peripheral surface of the body. The grooves may open on the side of the first end portion and may terminate in different positions on the side of the second end portion. The configuration described above enables the adjustment of the axis-directional position of the adaptor with respect to the body by changing the groove of the body, into which the protrusion of the adaptor is inserted. It is therefore possible to provide the sleeve system capable of adjusting the axis-directional position of the adaptor with respect to the body by a simple operation.

In a further mode of the golf club according to one aspect, the outer peripheral surface of the body may be further formed with a concavity extending in a periaxial direction. The concavity may be a portion via which the grooves communicate with each other in a position closer to the first end portion than terminals of the grooves in the axial direction, and may be enabled to receive insertion of the protrusion of the adaptor. With the configuration described above, a rotating position of the adaptor about the body can be varied by using the concavity. The configuration described above enables the adjustment of the axis-directional position of the adaptor with respect to the body without removing the adaptor completely from the body.

In a still further mode of the golf club according to one aspect, the adaptor may be configured in a cylindrical shape to attach to an outer peripheral surface of the body, and an inner peripheral surface of the adaptor may be formed with a plurality of engaging portions extending in an axial direction. The outer peripheral surface of the body may be formed with an engaged portions with which the plurality of engaging portions of the adaptor engages in the rotation-disabled manner in a periaxial direction. The engaged portion may be selectively engaged with one of the plurality of engaging portions to enable the adaptor to vary the axis-directional position with respect to the body. The adaptor maybe configured not to come off the body in such a direction as to separate from the hosel upon the engagement of the engaged portion of the body with one of the plurality of engaging portions of the adaptor. With the configuration described above, it is feasible to provide the sleeve system having the simple structure enabling the adaptor to detachably attached in the axial direction.

In a yet further mode of the golf club according to one aspect, the plurality of engaging portions may be disposed at a spacing in the periaxial direction on the inner peripheral surface of the adaptor. The plurality of engaging portions may be configured to differentiate the engagement positions in the axial direction with the engaged portions. With the configuration described above, the axis-directional position of the adaptor with respect to the body can be adjusted by the operation as simple as varying the periaxial direction when attaching and detaching the adaptor to and from the body.

In a yet further mode of the golf club according to one aspect, the body may include the first end portion and the second end portion at both ends in the axial direction, and the second end portion may be formed with the aperture to receive insertion of the shaft. The adaptor may include a first end portion and a second end portion at both ends in the axial direction, and the first end portion may engage with an upper end of the hosel. The plurality of engaging portions may be configured by protrusions protruding from the inner peripheral surface of the adaptor, and the protrusions may be formed so as to terminate in different positions on the side of the second end portion in the axial direction. The engaged portion may be configured by groove extending in the axial direction in the outer peripheral surface of the body, and the groove may open on the side of the first end portion and may terminate on the side of the second end portion. The body may further include an auxiliary groove receiving, upon the engagement of one of the protrusions with the groove, insertion of another protrusion. With the configuration described above, the axis-directional position of the adaptor with respect to the body can be adjusted by changing the protrusion of the adaptor, the protrusion being inserted in the groove of the body. It is therefore feasible to provide the sleeve system capable of adjusting the axis-directional position of the adaptor with respect to the body by the simple operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view illustrating a whole structure of a golf club according to an embodiment;

FIG. **2** is a plan view depicting a golf club head according to the embodiment;

FIG. **3** is an exploded view depicting a structure for joining the golf club head and a shaft together according to the embodiment;

FIG. **4** is a sectional view schematically illustrating an internal space of a hosel according to the embodiment;

FIG. **5**A is a front view schematically illustrating a body of a sleeve system according to the embodiment; FIG. **5**B is a side view schematically illustrating the body of the sleeve system according to the embodiment;

FIG. **6**A is a sectional view taken along the line A-A in FIG. **5**A; FIG. **6**B is a sectional view taken along the line B-B in FIG. **5**A;

FIG. **7** is a front view schematically illustrating an adaptor of the sleeve system according to the embodiment;

FIG. **8** is a sectional view taken along the line C-C in FIG. **7**;

FIG. **9**A is a view schematically illustrating a state of joining the sleeve system and the hosel together when attaching the adaptor to the body in a first position; and FIG. **9**B is a view schematically illustrating a state of joining the sleeve system and the hosel together when attaching the adaptor to the body in a second position;

FIG. **10**A is a front view schematically illustrating the body of the sleeve system in another mode; FIG. **10**B is a side view schematically illustrating the body of the sleeve system in another mode;

FIG. **11**A is a sectional view taken along the line D-D in FIG. **10**A; and FIG. **11**B is a sectional view taken along the line E-E in FIG. **10**A;

FIG. **12**A is a front view schematically illustrating the adaptor of the sleeve system in another mode; FIG. **12**B is a side view schematically illustrating the adaptor of the sleeve system in another mode;

FIG. **13**A is a sectional view taken along the line F-F in FIG. **12**A; FIG. **13**B is a sectional view taken along the line G-G in FIG. **12**A;

FIG. **14** is a front view schematically illustrating the body of the sleeve system in still another mode;

FIG. **15** is a front view schematically illustrating the body of the sleeve system in yet another mode;

FIG. **16**A is a perspective view schematically illustrating the body of the sleeve system in yet another mode; and FIG. **16**B is a side view schematically illustrating the body of the sleeve system in yet another mode;

FIG. **17**A is a perspective view schematically illustrating the adaptor of the sleeve system in a further mode; FIG. **17**B

is a sectional view schematically illustrating the adaptor of the sleeve system in the further mode;

FIG. **18**A is a perspective view schematically illustrating the adaptor of the sleeve system in the yet further mode; FIG. **18**B is a plan view schematically illustrating the adaptor of the sleeve system in yet further mode; FIG. **18**C is a sectional view schematically illustrating the adaptor of the sleeve system in the yet further mode; and

FIG. **19** is a perspective view schematically illustrating the body of the sleeve system in the yet further mode.

DESCRIPTION OF EMBODIMENT

An embodiment (which will hereinafter be referred to also as "the present embodiment") according to one aspect of the present invention will hereinafter be described with reference to the accompanying drawings. However, the present embodiment, which will be discussed below, is merely an exemplification of the present invention in every respect. A variety of improvements and modifications may be made without deviating from the scope of the present invention. In other words, a specific configuration corresponding to the embodiment may be properly adopted upon carrying out the present invention. Note that the description will be made based on directions on planes of the drawings for the convenience of explanation in the following discussion.

§ 1. Whole Structure of Golf Club

At first, a whole structure of a golf club is described with reference to FIGS. **1** and **2**. FIG. **1** is a perspective view illustrating a whole structure of a golf club **100** according to the present embodiment. FIG. **2** is a plan view depicting a golf club head **10** according to the present embodiment.

As depicted in FIGS. **1** and **2**, the golf club **100** according to the present embodiment includes a shaft **20** and the golf club head **10** (which will hereinafter be also simply termed the "head") joined to an end portion of the shaft **20**. The shaft **20** and the golf club head **10** are jointed to together via a sleeve system **6** that will be described later on, thereby providing a configuration enabling a club length to vary. Note that the club length may not be strictly defined if able to indicate a substantial length from a distal end of the shaft **20** on a grip side down to a bottom face of the head **10**. The club length can be measured by, e.g., a 60-degrees method (based on a 60-degree lie angle as a standard angle), a heel end method and other equivalent methods specified in the Rules of Golf. The respective members thereof will hereinafter be described.

The shaft **20** is configured to take a hollowed cylindrical shape, and the golf club head **10** is joined to a lower end of the shaft **20**. A grip composed of a rubber and other equivalent materials is, though not illustrated, fixed to the upper end of the shaft **20**. The materials for the shaft **20** may be properly selected corresponding to the embodiment and may involve using, e.g., CFRP (Carbon Fiber-Glass Reinforced Plastics), steel and other equivalent materials. Note that an extending direction of the shaft **20** corresponds to an "axial direction" according to the present invention. The "axial direction" may not, however, be strictly defined if able to indicate a direction of connecting an upper end and a lower end of every member.

The golf club head **10** has a hollowed structure. An external surface of the golf club head **10** is configured by a face **1**, a crown **2**, a sole **3**, a side **4** and a hosel **5**. The face **1** has a face surface to hit a golf ball. The crown **2** is adjacent to the face **1** and configures an upper surface of the head **10**. The sole **3** configures a bottom face of the head **10** and is adjacent to the face **1** and the side **4**. The side **4** is a portion between the crown **2** and the sole **3**. The side **4** is also a portion extending from the side of a toe of the face **1** to the side of a heel of the face **1** via a back side of the head **10**.

The hosel **5** is a cylindrical portion provided neighboring to the side of heel of the crown **2**, and has a hole **51** for attaching the shaft **20**. Specifically, the hole **51** receives insertion of a body **7** of the after-mentioned sleeve system **6** together with the shaft **20**, the sleeve system **6** being fixed to the lower end of the shaft **20**. An in-depth description of an internal structure of the hosel **5** will hereinafter be made. Note that the head **10** to be explained in the present embodiment is of a wood type instanced by a driver (#**1**) or a fairway wood, but is not limited to the type thereof. The head **10** may adopt a variety of types instanced by a so-called utility type, a so-called hybrid type, a so-called iron type, a so-called putter type and other equivalent types.

§ 2 Joint Structure between Shaft and Golf Club Head

Next, a joint structure between the shaft **20** and the golf club head **10** is described with reference to FIGS. **3** through **8**. FIG. **3** is an exploded view illustrating the joint structure between the shaft **20** and the golf club head **10**. As illustrated in FIG. **3**, the shaft **20** and the golf club head **10** are joined together via the sleeve system **6**. The sleeve system **6** includes the body **7** and an adaptor **8**. At least a part of the body **7** is fixed in a state of being housed in an internal space of the hosel **5** by a washer **11** and a fixture **9**. Components of the joint structure will hereinafter be described.

[Hosel]

The description starts with the internal space of the hosel **5**, into which the body **7** of the sleeve system **6** is inserted, with reference to FIG. **4**. FIG. **4** is a sectional view schematically illustrating the internal space of the hosel **5**. As depicted in FIG. **4**, the internal space of the hosel **5** according to the present embodiment is configured by a first diametral portion **52**, a second diametral portion **53** and a third diametral portion **55** in the sequence from an upper end **56** down to a lower end **57**.

The first diametral portion **52** is formed in a cylindrical shape, and opens at the upper end **56**. The second diametral portion **53** is continuous from the first diametral portion **52** and formed in the cylindrical shape being slightly smaller in diameter than the first diametral portion **52**. The second diametral portion **53** has an inner peripheral surface formed with a plurality of groove lines (unillustrated) corresponding to a plurality of protrusion lines **721** formed along an outer peripheral surface of a second cylindrical portion **72** of the after-mentioned body **7**. In the present embodiment, the first diametral portion **52** and the second diametral portion **53** cooperate to form the hole **51** that opens at the upper end **56**. Note that the inner peripheral surface of the second diametral portion **53** may also be formed in a polygonal shape in place of the plurality of groove lines formed as described above. In this case, it may be sufficient that the second cylindrical portion **72** itself is formed in the polygonal shape in section by substituting for the plurality of protrusions **721** formed on the outer peripheral surface of the second cylindrical portion **72** of the after-mentioned body **7**.

The third diametral portion **55** taking the cylindrical shape is disposed on the side of the lower end of the second diametral portion **53**. A partition wall **541** is provided between the third diametral portion **55** and the second diametral portion **53**. The partition wall **541** is formed with a circular aperture **54** being smaller in diameter than the second and third diametral portions **53**, **55**, the aperture **54** penetrating the interior in a vertical direction. The partition wall **541** is therefore formed in an annular shape. The second diametral portion **53** communicates with the third diametral

portion **55** via the aperture **54**. Note that the third diametral portion **55** opens at the lower end **57**. With this configuration, the internal space of the hosel **5** penetrates down toward the side **4** and the sole **3** of the head **10** substantially in parallel with the axial direction of the shaft **20**.

When assembling the golf club **100**, the body **7** of t the sleeve system **6** is inserted from the upper end **56** into the first diametral portion **52** and the second diametral portion **53** of the hosel **5**. The adaptor **8** is attached to the body **7** and is formed larger in outside diameter than the first diametral portion **52**. The body **7** can be thereby inserted downward in the axial direction till a lower end **84** of the adaptor **8** engages with the upper end **56** of the hosel **5**. On the other hand, the washer **11** and the screw-shaped fixture **9** are inserted into the third diametral portion **55** from the lower end **57**. The fixture **9** is screw-fastened to the body **7**. The sleeve system **6** is thereby fixed removably in the axial direction.

Note that the fixture **9** is constructed to include a head portion **91** and a screw portion **92** joined to the head portion **91** as depicted in FIG. **3**. The screw portion **92** is formed smaller in diameter than a diameter of the aperture **54** so that the screw portion **92** can be inserted into the aperture **54** to reach the second diametral portion **53** from the lower end **57**. By contrast, the head portion **91** is formed larger in diameter that the diameter of the aperture **54** so that the overall fixture **9** does not pass through the aperture **54**. As depicted in FIGS. **9**A and **9**B that will be given later on, the head portion **91** is formed with a rectangular recessed portion **911** receiving insertion of a wrench. A user is consequently enabled to fasten or unfasten the sleeve system **6** by operating the wrench being attached in the recessed portion **911**.

[Sleeve System]

(Body)

Next, the body **7** of the sleeve system **6** according to the present embodiment is described with reference to FIGS. **5**A, **5**B, **6**A and **6**B. FIG. **5**A is a front view schematically illustrating the body **7** according to the present embodiment. FIG. **5**B is a side view schematically illustrating the body **7** according to the present embodiment. FIG. **6**A illustrates a section taken along the line A-A in FIG. **5**A. FIG. **6**B depicts a section taken along the line B-B in FIG. **5**A.

As illustrated in FIGS. **5**A and **5**B, the body **7** according to the present embodiment includes two ends, i.e., an upper end **75** and a lower end **76** in the axial direction (the vertical direction as viewed in the drawings). The upper end **75** corresponds to "a second end portion of the body portion" according to the present invention. The lower end **76** corresponds to "a first end portion of the body portion" according to the present invention. The body **7** according to the present embodiment includes a first cylindrical portion **71** and a second cylindrical portion **72** being smaller in diameter than the first cylindrical portion **71** in the sequence from the upper end **75**.

The first cylindrical portion **71** is inserted into the first diametral portion **52** of the hosel **5**. The first cylindrical portion **71** is larger in outside diameter than the second diametral portion **53**, in inside diameter, of the hosel **5** and is configured to be insertable into the first diametral portion **52** of the hosel **5**. If not taking the after-mentioned adaptor **8** into consideration, the body **7** can be therefore inserted into the internal space of the hosel **5** till a lower end face **716** of the first cylindrical portion **71** abuts on a stepped portion formed between the first diametral portion **52** and the second diametral portion **53**.

The first cylindrical portion **71** has an outer peripheral surface **715** formed with four grooves **711-714** recessed inward in a radial direction and extending in the axial direction. The four grooves **711-714**, which are disposed in a periaxial direction (in a peripheral direction) at an equal interval, extend upward from the lower end of the first cylindrical portion **71** in the axial direction and terminate on the side of the upper end **75**. A terminal portion of each of the grooves **711-714** takes a shape being bent upward. The terminal portion of each of the grooves **711-714** may not take the upward bent shape but may be formed in a rectangular shape other than this bent shape. Note that the following discussion will designate the four grooves **711-714** as first through fourth grooves **711-714** for the convenience of explanation.

The first cylindrical portion **71** is herein formed larger in diameter than the second cylindrical portion **72**. The first cylindrical portion **71** has its lower end formed with a stepped portion corresponding to a difference in diameter between the first cylindrical portion **71** and the second cylindrical portion **72**. A lower end of each of the grooves **711-714** extends to this stepped portion (the end face **716**). The grooves **711-714** therefore open on the side of the lower end **76**.

As illustrated in FIGS. **5**A and **5**B, in the four grooves **711-714** formed in the outer peripheral surface **715** of the first cylindrical portion **71**, the first groove **711** and the third groove **713** are disposed opposite with each other and terminate in the same position on the side of the upper end **75**. Similarly, the second groove **712** and the fourth groove **714** are disposed opposite with each other and terminate in the same position on the side of the upper end **75**.

However, the terminating position of the second groove **712** and the fourth groove **714** is different from the terminating position of the first groove **711** and the third groove **713**. To be specific, the second groove **712** and the fourth groove **714** terminate in the position closer to the upper end **75** than the first groove **711** and the third groove **713**. Therefore, when comparing the section (FIG. **6**A) taken along the line A-A in FIG. **5**A with the section (FIG. **6**B) taken along the line B-B closer to the upper end **75** than the line A-A, the second groove **712** and the fourth groove **714** appear on both of FIGS. **6**A and **6**B, while the first groove **711** and the third groove **713** appear in only FIG. **6**A.

A couple of grooves (**711**, **713**) and another couple of grooves (**712**, **714**) being disposed opposite with each other, correspond to "engaged portions" according to the present invention. The grooves **711-714** correspond to "grooves" according to the present invention. Accordingly, the present embodiment exemplifies an instance of providing the plurality of engaged portions terminating in the different positions on the side of the upper end **75**.

The second cylindrical portion **72** is inserted into the second diametral portion **53** of the hosel **5**. The second cylindrical portion **72** is therefore formed smaller in outside diameter than the first cylindrical portion **71** to be insertable into the second diametral portion **53** of the hosel **5**. The second cylindrical portion **72** has its outer peripheral surface formed with a plurality of protruded lines **721** extending in the axial direction. The plurality of protruded lines **721** corresponds to groove lines formed in the inner peripheral surface of the second diametral portion **53** of the hosel **5**. Consequently, when the body **7** is inserted in the axial direction into the hole **51** of the hosel **5**, the plurality of protruded lines **721** formed on the second cylindrical portion **72** of the body **7** engages with the plurality of groove lines formed in the second diametral portion **53** of the hosel **5**. The body **7** and the hosel **5** are thereby joined together so as to be rotation-disabled in the periaxial direction. Note that the

phrase "being joined" or "joining" connotes herein at least "the two members being secured not to be movable" but is not requested "to prevent the two members from being separated even by receiving an external force applied". The same definition is applied to the phrase "being joined" or "joining" to be used as below.

The body **7** has an external shape extending in the vertical direction. The body **7** includes a use-for-shaft recessed portion **73** opening on the side of the upper end **75** in an area substantially covering existence of the first cylindrical portion **71**. The use-for-shaft recessed portion **73** has a cylindrical inner peripheral surface extending in the vertical direction and receives insertion of the lower end of the shaft **20**. The shaft **20** is fixed to the use-for-shaft recessed portion **73** by a fixing means instanced by a bonding agent and other equivalent agents. An axial center S (see FIG. **1**) of the shaft **20** is thereby fixed so as to extend in an extending direction (the vertical direction in FIGS. **5**A and **5**B) of the use-for-shaft recessed portion **73**. Note that the bonding agent for fixing the shaft **20** may be, without being limited to a particular agent, properly selected corresponding to the embodiment.

The body **7** further has a use-for-fixture recessed portion **74** opening on the side of the lower end **76** in an area substantially covering existence of the second cylindrical portion **72**. An inside diameter of the use-for-fixture recessed portion **74** corresponds to an outside diameter of the screw portion **92** of the fixture **9**. The use-for-fixture recessed portion **74** has its inner peripheral surface formed with a female thread (unillustrated) to which a male thread (unillustrated) formed on an outer peripheral surface of the screw portion **92** is screwed. Consequently, after inserting the body **7** into the hole **51** of the hosel **5**, the fixture **9** is inserted into the internal space from the lower end **57** of the hosel **5**, and the screw portion **92** of the fixture **9** is screwed to the use-for-fixture recessed portion **74** of the body **7**, thereby enabling the fixture **9** and the body **7** to be screw-fastened together.

(Adaptor **8**)

Next, the adaptor **8** of the sleeve system **6** according to the present embodiment is described with reference to FIGS. **7** and **8**. FIG. **7** is a front view schematically illustrating the adaptor **8** according to the present embodiment. FIG. **8** depicts a section taken along the line C-C in FIG. **7**

As depicted in FIG. **7**, the adaptor **8** according to the present embodiment is cylindrically formed to be attached on the outer peripheral surface **715** of the body **7**. The adaptor **8** includes an upper end **83** and a lower end **84**. The upper end **83** corresponds to "a second end portion of an adaptor portion" according to the present invention. The lower end **84** corresponds to "a first end portion of the adaptor portion" according to the present invention.

The adaptor **8** opens at both of the upper end **83** and the lower end **84**. The adaptor **8** includes a through-hole **82** penetrating in the vertical direction. The adaptor has the outer peripheral surface **81** being tapered so that the outside diameter thereof gradually expands toward the lower end **84**. The outer peripheral surface **81** of the adaptor **8** at the lower end is formed to have a larger outside diameter than the inside diameter of the first diametral portion **52**. With this configuration, the lower end **84** of the adaptor **8** is not attached in the first diametral portion **52** of the hosel **5** but engages with the upper end **56** of the hosel **5**. On the other hand, the adaptor **8** includes an inner peripheral surface **823** having an inside diameter (S**1** in FIG. **8**) that is uniformed corresponding to the outside diameter of the first cylindrical portion **71** of the body **7**.

As depicted in FIGS. **7** and **8**, the inner peripheral surface **823** of the adaptor **8** is provided with a couple of protrusions (**821**, **822**) protruding inward in the radial direction. The couple of protrusions (**821**, **822**) corresponds to "engaging portion" according to the present invention. The protrusions (**821**, **822**) are disposed opposite with each other. The protrusions (**821**, **822**) are configured to extend upward from the lower end **84** and terminate in the same position on the side of the upper end **83**. Terminal portions of the protrusions (**821**, **822**) take shapes being bent upward corresponding to the terminal portions of the grooves **711**-**714** formed in the body **7**. Note that the following discussion designates these two protrusions also as a first protrusion **821** and a second protrusion **822** for the convenience of explanation.

The protrusions (**821**, **822**) have heights (length in the radial direction) corresponding to depths (lengths in the radial direction) of the grooves **711**-**714** formed in the body **7**. In other words, the protrusions (**821**, **822**) are configured to have substantially the same heights as the depths of the grooves **711**-**714** formed in the body **7**. The inside diameter S**1** of the inner peripheral surface **823** exclusive of the protrusions (**821**, **822**) is substantially equivalent to the outside diameter of the first cylindrical portion **71** of the body **7**.

Therefore, according to the present embodiment, the attaching of the adaptor **8** to the body **7** from the upper end **75** causes the lower end of each of the protrusions (**821**, **822**) of the adaptor **8** to abut on the end face on the side of the upper end **75** of the body **7**. Consequently, the adaptor **8** is disabled from being attached in the first cylindrical portion **71** in the axial direction even by trying to attach the adaptor **8** to the body **7** from the upper end **75**. Thus, the adaptor **8** cannot be mounted onto the body **7**.

By contrast, the attaching of the adaptor **8** to the body **7** from the lower end **76** enables the protrusions (**821**, **822**) to move in the axial direction along the couple of grooves (**711**, **713**) in such a rotating position that the two protrusions (**821**, **822**) engage with the couple of grooves (**711**, **713**). Specifically, the protrusions (**821**, **822**) remain movable till the terminals (upper ends) of the protrusions (**821**, **822**) abut on the terminals (upper ends) of the grooves (**711**, **713**), but are unmovable any more upward in the axial direction. The adaptor **8** can be therefore attached in the first cylindrical portion **71** in the axial direction till the terminals of the protrusions (**821**, **822**) abut on the terminals of the grooves (**711**, **713**).

Specifically, on the occasion of attaching the adaptor **8** to the body **7** from the lower end **76**, the adaptor **8** is attached to the body **7** by being moved toward the upper end **75**, in other words, in such a direction as to separate away from the hosel **5** without coming off the body **7** in a position where the terminals of the protrusions (**821**, **822**) abut on the terminals of the grooves (**711**, **713**). The same is applied to the rotating position where the two protrusions (**821**, **822**) engage with the couple of grooves (**712**, **714**). Namely, the adaptor **8** can be attached in the first cylindrical portion **71** in the axial direction till the terminals of the protrusions (**821**, **822**) abut on the terminals of the grooves (**712**, **714**).

Note that the following discussion describes, for the convenience of explanation, the rotating position where the two protrusions (**821**, **822**) engage with the couple of grooves (**711**, **713**) also as "a first position", and describes the rotating position where the two protrusions (**821**, **822**) engage with the couple of grooves (**712**, **714**) also as "a second position". The following discussion further describes an axis-directional position where the adaptor **8** engages with the body **7** upon the abutting of the terminals of the

protrusions (**821**, **822**) on the terminals of the grooves (**711**, **713**) as "a first engagement position". The following discussion still further describes an axis-directional position where the adaptor **8** engages with the body **7** upon the abutting of the terminals of the protrusions (**821**, **822**) on the terminals of the grooves (**712**, **714**) as "a second engagement position".

The terminating position of the first groove **711** and the third groove **713** is different from the terminating position of the second groove **712** and the fourth groove **714**. The first engagement position between the adaptor **8** and the body **7** in the first position is therefore different from the second engagement position between the adaptor **8** and the body **7** in the second position. The present embodiment enables a variation of the axis-directional engagement position where the adaptor **8** engages with the body **7** by varying the rotating position of the adaptor **8**, in other words, varying the attaching direction of the adaptor **8** to the body **7**. In other words, the present embodiment enables the variation of the axis-directional position of the adaptor **8** with respect to the body **7** by causing the two protrusions (**821**, **822**) to selectively engage with the couple of grooves in the two couples of grooves.

The second groove **712** and the fourth groove **714** terminate in the position closer to the upper end **75** than the first groove **711** and the third groove **713**. The second engagement position is therefore more upward than the first engagement position, and the adaptor **8** can be fastened to the body **7** closer to the upper end **75** in the axial direction by attaching the adaptor **8** to the body **7** in the second position than by attaching the adaptor **8** to the body **7** in the first position.

Note that the adaptor **8** is attached to the body **7** in each position, in which case the protrusions (**821**, **822**) engage with any of the four grooves **711**-**714**, with the result that the adaptor **8** is joined to the body **7** so as to be rotation-disabled in the periaxial direction. When trying to attach the adaptor **8** to the body **7** in a position other than those positions, the upper ends (the terminal portions on the side of the upper end **83**) of the protrusions (**821**, **822**) of the adaptor **8** abut on the end face **716** in the same way as in the case of attaching the adaptor **8** from the upper end **75**. A part of the upper end **83** not formed with the protrusions (**821**, **822**) can be attached in the first cylindrical portion **71**. However, the portion formed with the protrusions (**821**, **822**) is not inserted through the first cylindrical portion **71** to disable the adaptor **8** from attaching to the body **7**.

With the adaptor **8** being attached to the body **7** in the first position, the first protrusion **821** may engage with the first groove **711**, and the second protrusion **822** may engage with the third groove **713**. Alternatively, the first protrusion **821** may engage with the third groove **713**, and the second protrusion **822** may engage with the first groove **711**. The two protrusions (**821**, **822**) and the two grooves (**711**, **713**) are disposed in symmetry, and hence there is no difference therebetween. The same is applied to a case of attaching the adaptor **8** to the body **7** in the second position.

Note that materials of the body **7** and the adaptor **8** building up the sleeve system **6** may be properly selected corresponding to the embodiment, and the materials instanced by Ti (6-4Ti), Al (Al5052, Al7075) and other equivalent materials may also be used.

§ 3 Assembly of Shaft and Golf Club Head

Next, an assembly method of the golf club **100** configured as described above is described with reference to FIGS. **9**A and **9**B. Given specifically is a description of a method of attaching the shaft **20** to the golf club head **10**. FIGS. **9**A and **9**B schematically illustrate joined states of the sleeve system **6** and the hosel **5** when the adaptor **8** is attached to the body **7** in the first and second positions.

The user at first selects any one of the first position and the second position, and attaches the adaptor **8** to the body **7** from the lower end **76** of the body **7** mounted to the tip of the shaft **20**. Upon this operation, the protrusions (**821**, **822**) engage with any of four grooves **711**-**714**, resulting in a connection between the body **7** and the adaptor **8** in a rotation-disabled state.

Subsequently, the user inserts the body **7** attached with the adaptor **8** into the hole **51** of the hosel **5**. Even when attaching the adaptor **8** in any position, as illustrated in FIGS. **9**A and **9**B, the body **7** attached with the adaptor **8** can be inserted into the hole **51** of the hosel **5** till the lower end **84** of the adaptor **8** engages with the upper end **56** of the hosel **5**.

Herein, as depicted in FIG. **9**A, the configuration according to the present embodiment is that the second cylindrical portion **72** of the body **7** reaches the second diametral portion **53** of the hosel **5** even when selecting the first position in which to substantially decrease an axis-directional length from the lower end **84** of the adaptor **8** to the lower end **76** of the body **7**. Therefore, even with the first position being selected, the body **7** can be joined to the hosel **5** in the rotation-disabled state in the periaxial direction by causing the plurality of protrusion lines **721** formed on the second cylindrical portion **72** of the body **7** to engage with the plurality of groove lines formed in the second diametral portion **53** of the hosel **5**.

Additionally, as depicted in FIG. **9**B, the configuration according to the present embodiment is that, even when selecting the second position in which to substantially increase the axis-directional length from the lower end **84** of the adaptor **8** to the lower end **76** of the body **7**, in other words, even when the lower end (the lower end **76**) of the second cylindrical portion **72** of the body **7** becomes closest to the lower end of the second diametral portion **53** of the hosel **5**, a slight gap is formed between the lower end of the second cylindrical portion **72** of the body **7** and the lower end of the second diametral portion **53** of the hosel **5**. This configuration may reduce a possibility of occurrence of a deficiency caused by a dimensional error and other equivalent errors. Note that one instance of the deficiency due to the dimensional error and other equivalent errors may be given such that the lower end of the second cylindrical portion **72** will have reached the lower end of the second diametral portion **53** before inserting the body **7** completely into the internal space of the hosel **5**, resulting in the gap being formed between the lower end **84** of the adaptor **8** and the upper end **56** of the hosel **5**. This deficiency might be caused by an excess of the length between the lower end **84** of the adaptor **8** and the lower end **76** of the body **7** over the axis-directional length (the length in the vertical direction in the drawings) between the first diametral portion **52** and the second diametral portion **53** of the hosel **5**.

Finally, the sleeve system **6** is screw-fastened by inserting the fixture **9** together with the washer **11** in to the internal space of the hosel **5** from the lower end **57** of the hosel **5**. The configuration according to the present embodiment is that, as depicted in FIG. **9**A, even with the selection of the first position in which the gap occurs between the lower end **76** of the body **7** and the partition wall **541**, the screw portion **92** of the fixture **9** can be inserted into the use-for-fixture recessed portion **74**. The body **7** can be therefore screw-fastened by screwing the male thread of the screw portion **92** of the fixture **9** to the female thread of the use-for-fixture

recessed portion **74** through the insertion of the fixture **9** from the lower end **57** of the hosel **5**. With this operation, the sleeve system **6** is secured in the axial direction by the adaptor **8** and the fixture **9**, with the result that the shaft **20** is mounted to the golf club head **10**.

The present embodiment enables an adjustment of the engagement position of the adaptor **8** in the axial direction and determines a position for securing the shaft **20** upon the engagement between the lower end **84** of the adaptor **8** and the upper end **56** of the hosel **5**. In other words, the present embodiment eliminates a necessity for providing the system for securing the shaft **20** to the internal peripheral surface of the hosel **5**. According to the present embodiment, a diameter of a neck, i.e., the inside diameter of the internal space of the hosel **5** can be therefore prevented from increasing.

As illustrated in FIGS. **9**A and **9**B, an insertion depth L**1** of the shaft **20** with the selection of the first position is shorter by a dimension for attaching the adaptor **8** to the body **7** downward in the axial direction than an insertion depth L**2** of the shaft **20** with the selection of the second position. Consequently, the selection of the first position leads to a decreased depth of the insertion of the shaft **20** into the hosel **5** and leads to an increased club length. By contrast, the selection of the second position leads to an increased depth of the insertion of the shaft **20** into the hosel **5** and leads to a decreased club length. Hence, the user can adjust the club length to attain a desired length by selecting the rotating position for attaching the adaptor **8** to the body **7**. Note that the present embodiment enables the club length to be adjusted to two lengths corresponding to the first position and the second position.

According to the present embodiment, it is feasible to achieve the system for adjusting the club length with the simple components, i.e., the four grooves **711**-**714** provided in the body **7** and the two protrusions (**821**, **822**) provided on the adaptor **8**. The golf club **100** capable of varying the club length can be therefore attained with the simple configuration.

In the present embodiment, the operation of adjusting the club length is a mere operation of varying the direction for attaching the adaptor **8** to the body **7**. The present embodiment consequently enables the adjustment of the club length by the simple operation.

One aspect of the present embodiment aims at providing the golf club configured to make variable the club length with the simple structure not to increase the diameter of the neck. As described above, the present embodiment can provide the golf club configured to make variable the club length with the simple structure not to increase the diameter of the neck.

§ 4 Modified Example

The embodiment of the present invention has been discussed above, and the description made so far is a mere exemplification of the present invention in every respect. It is a matter of course that the invention can be improved and modified in a variety of forms without deviating from the scope of the present invention. For example, the components of the golf club **100** may be properly omitted, replaced and added in accordance with the embodiment. The shapes and the sizes of the components of the golf club **100** may also be properly set in accordance with the embodiment. For instance, the following modifications are available. Note that the same reference numerals and symbols as those assigned to the components in the embodiment discussed above, are used to designate the components of the modified example that will be described below for the convenience of explanation.

<4.1>

In the present embodiment, the body **7** is formed with the four grooves **711**-**714**. However, the number of the grooves to be formed in the body **7** may, without being limited to "4", be properly selected corresponding to the embodiment. In other words, the number of the engaged portions to be formed in the body **7** may be, without being limited to "2", equal to or larger than "3".

<4.2>

The couple of grooves (**711**, **713**) and another couple of grooves (**712**, **714**) according to the present embodiment correspond to the "engaged portions" according to the present invention. The present embodiment provides the two grooves to configure the "engaged portion". However, the number of the grooves to configure the "engaged portion" according to the present invention may be, without being limited to "2", properly selected corresponding to the embodiment. For example, the number of the grooves to configure the "engaged portion" may be "1" and may also be equal to or larger than "3". Note that the number of the protrusions to configure the "engaging portion" according to the present invention in this case may be the same as or equal to or smaller than the number of the grooves to configure the "engaged portion".

<4.3>

The grooves **711**-**714** of the body **7** are disposed at the equal interval in the embodiment. However, with the grooves **711**-**714** being disposed at spacings, the disposition of the grooves **711**-**714** may be properly determined corresponding to the embodiment, and the grooves **711**-**714** may not be disposed at the equal interval. It is to be noted in this case that the protrusions (**821**, **822**) of the adaptor **8** are disposed to enable the engagement with the couple of grooves (**711**, **713**) and another couple of grooves (**712**, **714**) disposed opposite with each other.

<4.4>

The embodiment described above provides the configuration enabling the adjustment of the axis-directional position of the adaptor **8** with respect to the body **7** by forming, e.g., the plurality of engaged portions of the body **7**. However, a method for providing the configuration enabling the adjustment of the axis-directional position of the adaptor **8** with respect to the body **7** may be, without being limited to the example given above, properly selected corresponding to the embodiment. For example, the embodiment may provide a configuration enabling the adjustment of the axis-directional position of the adaptor **8** with respect to the body by forming, as illustrated in FIGS. **10**A-**13**B, the plurality of engaging portions of the adaptor **8**.

FIG. **10**A is a front view schematically illustrating a body **7**A according to a modified example. FIG. **10**B is a side view schematically illustrating the body **7**A according to the modified example. FIG. **11**A depicts a section taken along the line D-D in FIG. **10**A. FIG. **11**B depicts a section taken along the line E-E in FIG. **10**A. FIG. **12**A is a front view schematically illustrating an adaptor **8**A according to the modified example. FIG. **12**B is a side view schematically illustrating the adaptor **8**A according to the modified example. FIG. **13**A depicts a section taken along the line F-F in FIG. **12**A. FIG. **13**B depicts a section taken along the line G-G in FIG. **12**A.

As illustrated in FIGS. **10**A, **10**B, **11**A and **11**B, the body **7**A according to the present modified example includes a second groove **712**A and a fourth groove **714**A disposed opposite with each other and formed in continuation from a lower end to an upper end of a first cylindrical portion **71**A. Protrusions (**821**A, **822**A, **824**, **825**) can be therefore unre-

strictedly inserted into the grooves (**712**A, **714**A) without engaging therewith in the axial direction. In this example, the couple of a first groove **711** and a third groove **713** of the body **7**A corresponds to the "engaged portion" according to the present invention, while the second groove **712**A and the fourth groove **714**A correspond not to the "engaged portion" but to "auxiliary grooves" according to the present invention.

On the other hand, as depicted in FIGS. **12**A, **12**B, **13**A and **13**B, the adaptor **8**A according to the modified example includes an inner peripheral surface **823** formed with four protrusions (**821**A, **822**A, **824**, **825**) extending in the axial direction. Similarly to the four grooves **711**-**714** according to the embodiment, the four protrusions (**821**A, **822**A, **824**, **825**) are disposed at the equal interval in the periaxial direction. Note that the following discussion designates the protrusions (**824**, **825**) as a third protrusion **824** and a fourth protrusion **825** respectively for the convenience of explanation.

This modified example is based on substantially the same principle as the principle of the embodiment described above, and provides a configuration enabling a variation of an axis-directional position in which the adaptor **8**A engages with the body **7**A. To be specific, the first protrusion **821**A and the second protrusion **822**A are disposed opposite with each other and terminate in the same position on the side of the upper end **83**. The third protrusion **824** and the fourth protrusion **825** are also disposed opposite with each other and terminate in the same position on the side of the upper end **83**. The adaptor **8**A can be therefore attached to the body **7**A not to come off on the side of the upper end **75** by selecting and engaging any one of the two couples of protrusions (**821**A, **822**A) and protrusions (**824**, **825**) with the grooves (**711**, **713**).

Herein, the terminating position of the first protrusion **821**A and the second protrusion **822**A is different from the terminating position of the third protrusion **824** and the fourth protrusion **825**. The first protrusion **821**A and the second protrusion **822**A terminate more downward in the axial direction than the third protrusion **824** and the fourth protrusion **825** terminate. Accordingly, the axis-directional engagement position of the adaptor **8**A upon engaging the protrusions (**821**A, **822**A) with the grooves (**711**, **713**) is more upward than the axis-directional engagement position of the adaptor **8**A upon engaging the protrusions (**824**, **825**) with the grooves (**711**, **713**).

In other words, the protrusions (**821**A, **822**A) engage with the grooves (**711**, **713**), in which case a depth of insertion of the shaft **20** into the hosel **5** increases, while the club length decreases. By contrast, the protrusions (**824**, **825**) engage with the grooves (**711**, **713**), in which case the depth of insertion of the shaft **20** into the hosel **5** decreases, while the club length increases. According to the modified example, the club length can be therefore adjusted by selecting the couple of protrusions that engage with the two grooves (**711**, **713**). Namely, the couple of protrusions (**821**A, **822**A) and another couple of protrusions (**824**, **825**) correspond to the "engaging portions" according to the present invention.

Note that the number of protrusion(s) to configure the engaging portion may not be "2" but may be "1" and may also be equal to or larger than "3". The number of the engaging portions formed on the adaptor **8**A may not be "2" but may be equal to or larger than "3". The body **7**A may be formed with not the grooves but the protrusions. The adaptor **8**A may be formed with not the protrusions but the grooves corresponding to this configuration. It may be sufficient that the grooves and the protrusions are disposed not strictly at the equal intervals but at the spacings. It maybe also sufficient that the second groove **712**A and the fourth groove **714**A are, when any one couple of protrusions engage with the couple of grooves (**711**, **713**), configured to prevent another couple of protrusions from interfering with this engagement but not configured in continuation to the upper end from the lower end of the first cylindrical portion **71**A.

<4.5>

The couple of the grooves (**711**, **713**) and the couple of the grooves (**712**, **714**) according to the embodiment described above correspond to the "engaged portions" according to the present invention. In other words, according to the embodiment described above, the plurality (two) of engaged portions are disposed at the spacing in the periaxial direction. However, the plurality of engaged portions may also be, without being limited to the disposition given in the foregoing example, disposed in the axial direction as illustrated in, e.g., FIG. **14**.

FIG. **14** illustrates a body **7**B including the plurality of engaged portions disposed in the axial direction. Illustrations of second groove **712** and a fourth groove **714** of the body **7**B are omitted. A first groove **711** includes two side grooves (**717**A, **718**A) disposed in the axial direction but on the left side in the periaxial direction. Similarly, the third groove **713** includes two side grooves (**717**B, **718**B) disposed in the axial direction but on the left side in the periaxial direction.

An axis-directional length of each of the side grooves (**717**A, **717**B, **718**A, **718**B) corresponds to an axis-directional length of each of the protrusions (**821**, **822**) of the adaptor **8**. Consequently, the protrusions (**821**, **822**) can engage with the side grooves (**717**A, **717**B) or the side grooves (**718**A, **718**B) by rotating the adaptor **8** about the body **7** leftward relatively in the periaxial direction to move the protrusions (**821**, **822**) into the grooves (**711**, **713**) in the axial direction. Namely, the couple of side grooves (**717**A, **717**B) and another couple of side grooves (**718**A, **718**B) correspond to the "engaged portions" according to the present invention. The plurality of engaged portions may be disposed as described above.

Note that the side grooves (**717**A, **717**B, **718**A, **718**B) extend in a side-by-side relation with the grooves (**711**, **713**) as depicted in FIG. **14**. The side grooves (**717**A, **717**B, **718**A, **718**B) are formed partially longer than the axis-directional lengths of the protrusions (**821**, **822**) of the adaptor **8**. The side grooves (**717**A, **717**B, **718**A, **718**B) include recessed portions (**717***a*, **717***b*, **718***a*, **718***b*) formed on the side of the upper end **75** of the body **7**B. The recessed portions (**717***a*, **717***b*, **718***a*, **718***b*) are separated from the grooves (**711**, **713**) in the peripheral direction. The body **7**B is secured to the hosel **5** by using the fixture **9** after mounting the adaptor **8** to the body **7**B, in which case the adaptor **8** receives a force acting upward in the axial direction from the hosel **5** with respect to the body **7**B. The protrusions (**821**, **822**) of the adaptor **8** consequently engage to attach in the recessed portions (**717***a*, **717***b*) of the side grooves (**717**A, **717**B) or the recessed portions (**718***a*, **718***b*) of the side grooves (**718**A, **718**B). The adaptor **8** can be therefore made difficult to rotate about the body **7** in the periaxial direction after the protrusions (**821**, **822**) have engaged with the side grooves (**717**A, **717**B) or the side grooves (**718**A, **718**B).

<4.6>

According to the embodiment described above, when varying the direction (the position in the peripheral direction) for attaching the adaptor **8** to the body **7**, the adaptor **8** is required to move downward in the axial direction with respect to the body **7** till the upper end of each of the

protrusions (**821**, **822**) is located more downward than the lower end of the first cylindrical portion **71**. In this connection, as illustrated in FIG. **15**, an operation of the modification may be facilitated by providing a concavity **719** via which the grooves **711**-**714** communicate with each other.

FIG. **15** illustrates a body **7**C provided with the concavity **719**. An outer peripheral surface of the body **7**C is formed with the concavity **719** extending in the periaxial direction. The concavity **719** communicates with the grooves **711**-**714** in a position lower than the terminals of the grooves **711**-**714**. The concavity **719** has a configuration enabling insertion of each protrusions (**821**, **822**). In other words, an axis-directional length of the concavity **719** is set corresponding to the axis-directional length of each of the protrusions (**821**, **822**). Therefore, the grooves, with which the protrusions (**821**, **822**) engage, can be modified by inserting the protrusions (**821**, **822**) through the concavity **719** without removing the adaptor **8** from the body **7** (at least the first cylindrical portion **71**).

Note that the grooves **711**-**714** communicate with each other via the concavity **719** in the position lower than the terminals of the grooves **711**-**714**. Consequently, the upper ends of the protrusions (**821**, **822**) abut on the terminals of the grooves **711**-**714**, on which occasion, with no interference of the concavity **719**, the adaptor **8** is prevented from rotating about the body **7** in the periaxial direction.

<4.7>

The embodiment described above involves forming the grooves as the engaged portion in the body **7** and forming the protrusions as the engaging portion on the adaptor **8**. The relation between the engaging portion and the engaged position is not, however, limited to the example given above. The engaged portion of the body **7** maybe configured by the protrusion, while the engaging portion of the adaptor **8** may also be configured by the groove.

Incidentally, it may be sufficient in this case that an after-mentioned groove is formed in the inner peripheral surface of the adaptor **8** in order to configure the adaptor **8** not to come off the body **7** in such a direction as to separate from the hosel **5**. To be specific, the groove of the adaptor **8** may be configured to open not on the side of the lower end **84** but on the side of the upper end **83**, to extend in the axial direction from the upper end **83** and to terminate on the side of the lower end **84**. With this configuration, when the adaptor **8** is attached to the body **7** from the lower end **76**, the protrusion formed on the outer peripheral surface of the body **7** abuts on the terminal of the groove on the side of the lower end **84**, with the result that the adaptor **8** is disabled from moving toward the upper end **75**. The adaptor **8** can be therefore configured not to come off the body **7** in such a direction as to separate from the hosel **5**. This example of replacing the protrusion and the groove with each other is described with reference to FIGS. **16**A, **16**B, **17**A and **17**B.

FIG. **16**A is a perspective view illustrating a body **7**D according to the modified example. FIG. **16**B is a side view illustrating the body **7**D according to the modified example. FIG. **17**A is a perspective view illustrating an adaptor **8**B according to the modified example. FIG. **17**B is a sectional view illustrating the adaptor **8**B according to the modified example.

As illustrated in FIGS. **16**A and **16**B, four protrusions **711**D-**714**D corresponding to the four grooves **711**-**714** in the embodiment are formed on an outer peripheral surface **715** of the body **7**D according to the present modified example. The protrusions **711**D-**714**D protrude outward in the radial direction and extend in the axial direction. The first protrusion **711**D and the third protrusion **713**D are disposed opposite with each other, and terminate in the same position in the axial direction on the side of the lower end **76**. Similarly, the second protrusion **712**D and the fourth protrusion **714**D are disposed opposite with each other, and terminate in the same position in the axial direction on the side of the lower end **76**.

The second protrusion **712**D and the fourth protrusion **714**D terminate in a position different from the terminating position of the first protrusion **711**D and the third protrusion **713**D. Specifically, the second protrusion **712**D and the fourth protrusion **714**D terminate closer to the upper end **75** than the first protrusion **711**D and the third protrusion **713**D terminate. The couple of protrusions (**711**D, **713**D) and another couple of protrusions (**712**D, **714**D) correspond to the "engaged portions" according to the present invention. The couple of protrusions (**711**D, **713**D) correspond to the couple of grooves (**711**, **713**), while another couple of protrusions (**712**D, **714**D) correspond to the couple of grooves (**712**, **714**). Note that the protrusions **711**D-**714**D may not be formed to cause upper end portions thereof to reach the upper end **75**.

On the other hand, as depicted in FIGS. **17**A and **17**B, the inner peripheral surface **823** of the adaptor **8**B according to the present modified example is formed with four grooves (**821**B, **822**B, **826**, **827**) corresponding to the four protrusions **711**D-**714**D of the body **7**D and being disposed at the equal intervals in the periaxial direction. The grooves (**821**B, **822**B, **826**, **827**) open on the side of the upper end **83**, and hence the adaptor **8**B can be attached to the body **7**D from the lower end **76**.

The grooves (**826**, **827**) disposed opposite with each other open also on the side of the lower end **84**, while the grooves (**821**B, **822**B) disposed opposite with each other do not open on the side of the lower end **84** but terminate in a position slightly upward from the lower end **84**. Consequently, on the occasion of attaching the adaptor **8**B to the body **7**D from the lower end **76**, the lower end portions of any one of the two couples of protrusions (**711**D, **713**D) and (**712**D, **714**D) abut on the lower end portions (terminals) of the couple of grooves (**821**B, **822**B), thereby preventing the adaptor **8**B from coming off the body **7**D from the upper end **75** as described above. The couple of grooves (**821**B, **822**B) terminates in the same position on the side of the lower end **84** in the axial direction, and corresponds to the "engaging portion" according to the present invention. In other words, the grooves (**821**B, **822**B) correspond to the protrusions (**821**, **822**).

Note that a state of causing the two grooves (**821**B, **822**B) of the adaptor **8**B to engage with the two protrusions (**711**D, **713**D) of the body **7**D, corresponds to the state of the first position described above. A state of causing the two grooves (**821**B, **822**B) of the adaptor **8**B to engage with the two protrusions (**712**D, **714**D) of the body **7**D, corresponds to the state of the second position described above. In every state, the two grooves (**826**, **827**) receive the insertion of the two protrusions not selected, as the two protrusions engaging with the two grooves (**821**B, **822**B) of the adaptor **8**B, from the two protrusions (**711**D, **713**D) and the two protrusions (**712**D, **714**D). In other words, the grooves (**826**, **827**) are used as the auxiliary grooves to receive the insertion of the protrusions, not used for positioning the adaptor **8**B in the axial direction, of the body **7**D.

<4.8>

The outer peripheral surface **81** and the inner peripheral surface **823** of the adaptor **8** are formed in the cylindrical shape in the embodiment discussed above. However, an external shape of the adaptor **8** may be, without being

limited to the example described above, properly varied corresponding to the embodiment. For example, the outer peripheral surface **81** and the inner peripheral surface **823** of the adaptor **8** may also be formed in a polygonal shape and an elliptical shape. Similarly, the external shape of the body **7** may also be properly varied.

<4.9>

In the embodiment described above, each of the protrusions (**821**, **822**) of the adaptor **8** takes the rectangular shape protruded inwards in the radial direction from the inner peripheral surface **823**. The shape of each of the protrusions (**821**, **822**) of the adaptor **8** may be, however, without being limited to the example given above, varied properly corresponding to the embodiment. Hereinafter, FIGS. **18**A-**18**C depict modified examples of the external shape of each of the protrusions (**821**, **822**) of the adaptor **8**.

FIGS. **18**A-**18**C are a perspective view, a plan view and a sectional view each schematically illustrating the adaptor **8**C of the sleeve system **6** according to another aspect. As illustrated in FIGS. **18**A-**18**C, each of the protrusions (**821**C, **822**C) may be formed as a stepped portion by providing a flat surface in a part of the circular inner peripheral surface **823**.

FIG. **19** is a perspective view illustrating a body **7**E used together with the adaptor **8**C. Though not illustrated in FIG. **19**, a third groove similar to a first groove **711**E is provided in a position opposite to the first groove **711**E. Further, a second groove similar to a fourth groove **714** is provided in a position opposite to the fourth groove **714**. The body **7**E is herein provided with the concavity **719** as in the case of the body **7**C. With this concavity **719** being provided, all of the grooves may not open on the side of the lower end **76**. In other words, all of the grooves may not reach the end face **716**, and it may be sufficient that a part of the grooves extend to the concavity **719** from the upper end **75**. The body **7**E illustrated in FIG. **19** includes the first groove **711**E (and the third groove) extending only toward the upper end **75** from the concavity **719** but not reaching the end face **716**. The insertion of the first protrusion **821**C and the second protrusion **822**C of the adaptor **8**C into the first groove **711**E and the third groove may simply involve inserting the first protrusion **821**C and the second protrusion **822**C up to the concavity **719** along the second groove and the fourth groove **714**. The first protrusion **821**C and the second protrusion **822**C of the adaptor **8**C can be thereby inserted into the first groove **711**E and the third groove via the concavity **719**.

<4.10>

In the embodiment described above, the use-for-shaft recessed portion **73** is formed to extend along the axial line (in the vertical direction in FIGS. **5**A and **5**B) of the body **7**. However, the shape of the use-for-shaft recessed portion **73** may be, without being limited to the example described above, properly selected corresponding to the embodiment. For example, the use-for-shaft recessed portion **73** may be configured to extend with an inclination from the axial line of the body **7**. This configuration enables fixation of the axial center S (see FIG. **1**) of the shaft **20** so as to extend with the inclination from the axial line of the body **7**.

<4.11>

The golf club head **10** according to the embodiment described above has the hollowed structure. The golf club head **10** may be therefore manufactured by joining two or more members. To be specific, the golf club head **10** may be manufactured by joining the head body formed with one or two or more apertures communicating with the hollowed portion to another member that seals the aperture. For instance, the crown **2** and the face **1** are constructed respectively of different members, and the head **10** can be configured by assembling the crown **2**, the face **1** and the head body together. Further, the head **10** can be also configured by forming the head body including the aperture provided in the sole **3** or the side **4** and sealing this aperture with the different member. This head body can be manufactured by, e.g., a lost wax precision casting process and other equivalent methods.

What is claimed is:

1. A golf club comprising:

1) a shaft;

2) a golf club head formed with a hosel extending along an axial direction, the hosel having a top hole into which a sleeve system is partially inserted, and a bottom hole through which a threaded portion of a screw is inserted, wherein the top hole is furthest from a sole of the golf club head in the hosel axial direction; and

3) the sleeve system, said sleeve system comprising:

A) a cylindrical shaped body extending along an axial direction and partially inserted into the hosel top hole with a bottom end portion, and a top end portion, wherein the bottom end portion of the body touches the bottom hole of the hosel,

said body comprising:

I) grooves of different length on a peripheral surface of the body each formed starting at the same axial position in the bottom end portion and each groove of the grooves of different length terminating at axially different positions in the top end portion;

II) a top aperture, through which the shaft is inserted, extending at least through the top end portion towards the bottom end portion, and attaching to a tip of the shaft; and

III) a bottom aperture extending axially within the bottom end portion, through which the threaded portion of the screw is inserted and containing threading to engage the treaded portion of the screw, said screw securing the body by tension across the screw between the threading of the body and, by way of a head of the screw, a bottom surface of the hosel bottom hole; and

B) a hollow cylindrical shaped adaptor with a portion sitting on a top surface of the hosel and a protrusion portion extending partially across the hole of the hosel, said protrusion portion:

i) permitting the body to lock into axially different positions by:

a) introduction of the protrusion portion of the adaptor into a respective groove of the grooves of different length of the body by rotation of the adaptor, followed by

b) sliding the protrusion portion of the adaptor or the respective groove of the body to selectively engage the protrusion portion with the respective termini of the respective groove thereto introduced into, and

ii) providing compression across the adaptor between the top surface of the hosel and the engaged groove of the body thus preventing the adaptor from coming off of the golf club.

2. The golf club of claim **1**, wherein the grooves on the peripheral surface of the body are linear.

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